OFFICIAL ORGAN OF THE NORTHWEST FRUIT GROWERS ASSOCIATION

VOLUME THREE NUMBER SEVEN DOLLAR A YEAR

BETTER FRUIT

January 1909

THE ABOVE CUT, SHOWING FRUIT GROWN ON PLACE OF W. S. HAXTON, PRESIDENT FRUIT GROWERS ASSOCIATION, KENNEWICK, WASHINGTON, GIVES A SPLENDID IDEA OF WHAT CAN BE DONE WITH SAGEBRUSH LAND

PUBLISHED BY BETTER FRUIT PUBLISHING COMPANY, HOOD RIVER, OREGON

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BETTER FRUIT

A MONTHLY ILLUSTRATED MAGAZINE PUBLISHED IN THE INTEREST
OF UP-TO-DATE AND PROGRESSIVE FRUIT GROWING AND MARKETING

STRAWBERRY GROWING A PROFITABLE BUSINESS

BY CHARLES H. COLLINS, KENNEWICK, WASHINGTON

HERE, in the Kennewick Valley, supporting some 125 families, are tilled and marketed a crop of strawberries from 250 acres or nearly so. When one is growing strawberries as a commercial crop, depending on it solely or nearly so for his income, one learns to figure the profit of marketing and the cost of producing such a crop. One patch of nine acres this season, under one-third yield, brought the grower 650 crates of strawberries, selling net to him at $3.30 per crate. This grower kept a very accurate expense account of his year's labor, figuring interest on the land, water rent, cultivation and labor on said patch for the entire season, allowing himself good wages, picking, packing and furnishing crates. The cost of production was $1.26 a crate. Had this been a full crop the cost of production would have been brought down to one dollar a crate.

Good cultivation and lots of it during the summer months has been found to put the patch in the best condition for producing the very earliest berries. Where a north slope can be had they are greatly favored by nature. Several plans for protecting early blooms against frost have been tried, some successfully, others successfully as far as keeping frost off is concerned. But the cost of such protection is too great to make it profitable or even possible for the grower to use it. The favorite method used in the Kennewick Valley this season was smudging pots. These are small sheet-iron pots, costing $22 a hundred, and requiring from forty to fifty pots to protect an acre. Crude oil was used to make a thick, dense, black smoke to hang over the patch early in the morning as the sun was rising, thus protecting the frost-covered leaves from coming in direct contact with the sun's rays until the plants had slowly thawed out, thus leaving them in a safe condition. By buying this crude oil in carload lots the cost of protecting the berry patch against one or two hard frosts, which is all one usually has to contend with, is brought down to a very nominal figure. The advisability of running a water sprinkler over the plants just at daybreak, wetting the plants thoroughly with cold water, thus drawing out the frost before the sun's rays strikes them, does in part the same as was intended by using the petroleum smoke. This plan was tested and proved very satisfactory. Also turning the water into rows in the entire patch at once, keeping the ground wet to a great extent, draws the frost from the plants to the water. When one realizes the value of the first picking of strawberries obtained from the first early blooms, you will realize why such efforts are made to thwart the action of the frost. In this valley, where the prevailing winds, and especially the cold winds of March, come principally from the southwesterly direction, a ridge of earth thrown up to the windward side of each row will protect and insure the grower berries several days earlier, and that means a difference of fifty cents to one dollar per crate.

Light land—we mean sandy and somewhat gravelly soil—produces the earliest strawberries, although patches of such soil do not produce berries for so long a season as the lower land. But owing to the higher prices being paid for earlier berries the heavier ground has not much the advantage. As an illustration as to whether it pays to prepare and cultivate berries for profit, the writer calls to mind a patch of berries which two years ago was all one field, but last spring this patch was separated; one man working one part and another pretending to work the other one. The part worked, a little less than one-fourth of an acre—to be accurate, 37 rods of land—yielded the owner forty-nine crates of fancy Clark Seedling berries, netting him $3.50 per crate, making a return of $171.50 from the one-fourth of an acre. The other patch above mentioned, with the same soil, planted by the same man, cultivated under similar conditions until the time of the line fence being put up, was allowed to grow in a much neglected condition, brought about by too frequent watering and not enough cultivating and no fertilizing whatsoever, and brought this grower something less than seven crates off of a patch twice as large, and these seven crates of berries a poor grade of culls.

We have arrived at the stage where we know, or ought to know, that there is profit, which has been fully demonstrated by individual growers, in commercial strawberry growing, but one cannot just happen to get a crop; there is something besides luck connected with the man getting a banner yield; his forethought and putting what he knows into execution will bring him satisfactory results.

Begin a year ahead to prepare the land, before you intend to set the plants. You say "you cannot afford to lose a year's use of the land." Well, take good growers words for it that it is the best year's work you ever did, to store up material in the way of nitrogen and vegetable matter which sage brush land lacks. Common barnyard manure is greatly beneficial, but nothing builds up the land for berry crops like the turning under of a green crop, and not only a green crop or decayed vegetable matter but the roots of clover, alfalfa, vetches, cowpeas, etc., have conveyed the nitrogen from the air into the soil and stored it there where it does not exhaust itself in a single year. A big mistake is made by a great many farmers in thinking that a green crop is all the land needs for a complete land builder, as the roots are also very important for the establishing of the fertility of the soil. When you have got your land properly fixed, then get good, strong, clean plants from patches which have not been allowed to bear a crop if possible, and not plants from a patch bearing over one crop at the outside. Cheap, spindly plants furnish the most expensive kind of experience for a new grower to buy. After getting the soil prepared right and getting good plants planted in good ground, the results will then be up to the cultivation of the plants until the crop is ready for market. Too much stress cannot be laid on the fact that although strawberries are composed of water they must not be kept growing in water, but frequent waterings at and during the ripening season is very essential. By cultivation arranged so that it can be done with the horse, a fine-tooth cultivator preferred, going over the ground frequently, yes, oftener, keeping the top of the soil fine, you thus do two things at once, keep your ground free of weeds and keep the moisture in the land and bring it to the top where the surface roots of the berries can easily reach it. By more cultivation and less watering you greatly reduce your percentage of weeds, as water brings weeds and causes them to grow, where cultivation brings the moisture and kills the weeds. There are several advantages in the strawberry

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business; the principle one is that the crop is on and off before the hot weather, thus affording the farmer time to take things a little easy, if he arranges his work right. It certainly pays, like every other business, to do what you do thoroughly and well. Too many men try to grow berries on the street corner or some other place off their own patch. There is time for holidays, but the grower should see that his plants are not suffering while he is telling some other fellow how to grow berries. If you do not know how to grow them, start on a small scale and feel your way. It looks easy to a man to see the growing of berries, but doing it and doing it profitably is the result of combined experience and willingness to do work. Here, where we depend on our distantly located cities for our best markets, we must have a berry with good shipping qualities, a berry that will not fade in color if it is four days on the road. The favorite berry for this purpose in the Kennewick Valley is the Clark Seedling, a production of Hood River brains and experience.

Colo. Ag. Expt. Sta.

PLATE 1

Too much stress cannot be laid on the fact that if we are to get the big prices of $3 to $3.50 per crate for berries we must keep up the quality of the berries. Some farmers seem to think that they can deceive the buyers. For a time they can, but in the end they do themselves an injury and nothing will tend to drop the price of berries like the arrival of a batch of inferior berries. As a poor quality cannot be held up for a better price they must be pushed off as quickly as possible, thus causing a decline for one grade of berries, which usually affects the other grades as well. Grade your berries in the berry patch and then again in the packing house; you cannot be too particular. Have a good picking boss, whose duty will be to see that the berries are picked right, not pulled and mashed, and that the vines are picked clean, as over-ripe berries come from the left-over ones. The packing boss should establish a standard for packing and see that it is followed out, as uniformity must be your pack. Farmers will find it much more interesting to grow a good crop as well as a profitable one. Berries look like little things to give much time to, but they will pay you well for your labor. Try them.

PARTICULARS AND PROPER METHODS IN THE CULTIVATION AND GROWING OF STRAWBERRIES

BY J. A. ROSE, KENNEWICK, WASHINGTON

OWING to the variety of climate and soils in our state, a successful method of growing strawberries in one section may not give the same results in another. We must review something of the physiology of the plants and the cause which produces results. The causes which lead to sickness and death in plants and animals are materially different. The bodies of plants and animals are composed of the same chemical elements. The plant eats manure and the animal eats plants, and when the animal dies its flesh is put back into the soil to be eaten in turn by the plants. So-called commercial fertilizers are largely made of the blood, bones and flesh of animals.

If you are growing strawberries for the market, you must grow the variety the market demands. It is not what you want, but what the people want. The best shipper and the berry that brings the best price in our state is the Clark Seedling. Any good soil will do to grow strawberries on. There are four things required to get the best results in strawberry growing. These are, humus or decayed vegetable matter to make the ground mellow, so it will hold moisture and permit the circulation of air through it to make the food matter available. The other ingredients are nitrogen, potash and phosphoric acid.

While the experiment stations are doing a good thing for us and are ever ready to assist us in every way possible, I will cite a case of the New York Experiment Station in 1897. They took a piece of stony land that was considered worthless, and in three years, with the application of the proper fertilizer, produced 8,383 quarts of strawberries to the acre. Our land, being of volcanic formation, is very productive, and with a proper study of our soils there is no reason why we should not produce 500 to 600 crates of strawberries to the acre, instead of 150 crates, the average we are now producing.

A man starting strawberry growing must study his soil and find out if any of these ingredients are lacking, and if the soil is deficient in one or more of these ingredients they must be supplied by commercial fertilizer or other means. On the average soil I would advise a good coat of barnyard manure, plowed under one year before the strawberry is planted. My experience in strawberry growing in Clarkston and Kennewick is by irrigation, hence I will give my method. If it is sage brush land, the first thing to do is to level the land to a perfect grade; plow six or seven inches deep, prepare a good seed bed, made by ditches four feet apart and three inches deep. I do not like deep ditches, as they take more water and the ground drys out quickly. Set the plants on each side of the ditch, the rows being eighteen inches apart and eighteen inches apart in the row, leaving the rows thirty inches in the middle for the pickers to work and a good chance to cultivate, and planting sixteen thousand plants to the acre. I give thorough cultivation during the summer season and early spring, keep all runners cut off during the summer. Do not cultivate after the vine begins to bloom. After picking I mow the tops off, being careful not to cut the crown. Keep water off until about the middle of July; from then on a liberal amount of water, giving the time to make foliage and fruit buds. I give the picking and packing as much attention as any other part of the business. The berries are picked and carried to the packing house, there gone over and all inferior and soft berries picked out, nicely rounded up, so that when they are put in the crate the top fits tight enough so they will not move around while shipping. In fact, the packing is the most important part of the business, for if we expect to get top prices we must put up a first class pack.

◆ ◆ ◆

WHEN planting an orchard it is necessary to know whether the varieties are self fertile or self sterile, and their ability to cross fertilize with other varieties. Failure to set fruit is not always due to imperfect fertilization. Efficiency of pollen varies with the conditions of the tree and the environment. Some of the main factors which govern pollination are vigor, variety, health, age, heredity and vitality of the trees. Most all varieties are improved by cross fertilization, and a large orchard should be planted with a third of the trees as pollen producers. It is known that the same varieties do not blossom at the same time in different localities, but like conditions will affect the same varieties. Varieties that are useful for producing pollen must blossom at the same time the desired varieties come into bloom and the pollen must be potent on that variety.—Ex.

EFFECT OF ARSENICAL POISONING ON FRUIT TREES

BY WM. P. HEADDEN, OF THE COLORADO AGRICULTURAL COLLEGE

THE editor has read the following article three times very carefully before deciding to publish it. However, it is my judgment that the artiele should be published, for I believe it is a very important diseovery and a timely one. The objeetion to publishing the artiele would be that it might create an unneeessary seare, but the editor publishes it for the same reason that the staff of the Colorado Experimental Station had in giving it to the publie. There is no oeeasion for any alarm, but a word of eaution seems proper, and if Professor Headden is eorreet, eertainly preeautionary steps, sueh as are suggested, should be taken.

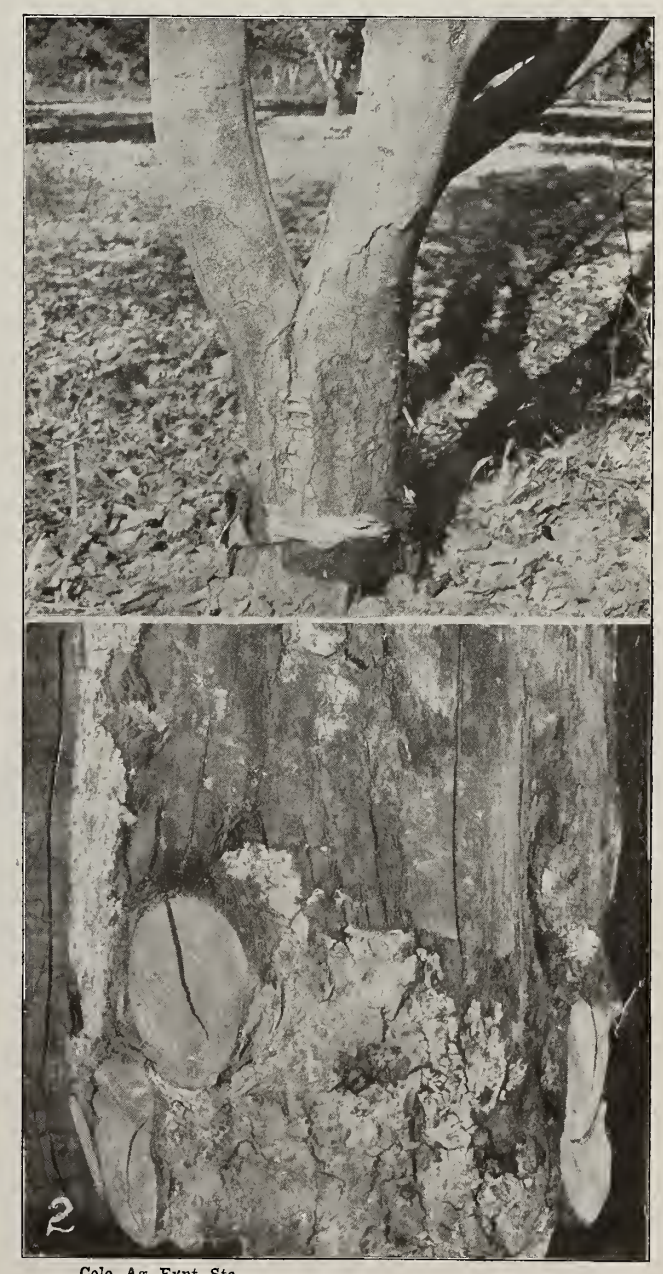
Colorado is older in the fruit business than the Northwest, and has used arsenie not only longer than the Northwest, but, I think I am justified in saying, also in greater quantities, at least I make this inferenee from this artiele.

A few eases have eome under the observation of the editor where trees have died. There was some seale on the trees and some anthraenose, but not suffieient to justify eonelusion that they had been the eause of the death of the tree. In interviewing old growers, about the only opinion that they saw fit to express was that the tree was siek, whieh of eourse was self evident, but they did not know the eause. Some of these dead trees, that have been seen by the editor, showed the dead bark around the erown of tree, whieh was the only evidenee of disease. Further investigation was not made and no eause or proof assigned for the death of tree. After reading the following artiele, it is the opinion of the editor that arsenie possibly might have been this eause, although there is not eonelusive evidenee, and as the trees have been destroyed there is no opportunity now to take advantage of the information eontained in this artiele for determining whether or not the death was eaused by arsenie poisoning. Professor Headden lays great stress on the faet that arsenie poisoning is only apt to oeeur in distriets where the soil is strongly alkali, eontaining sodie-sulphate, earbonate or chloride, known by eommon names as glaubers salt and sal soda, an ordinary salt. Of eourse, it is well known that in many fruit distriets of the Northwest there is no alkali in the soil, and consequently in sueh distriets less is to be feared from arsenie poisoning than in distriets where alkali is prevalent, for the reason that without alkali in the soil the arsenie is not apt to beeome soluble. However, in all eases, in view of the investigation made by Professor Headden, it would seem wise that every grower should use sueh preeautionary measures as are suggested in the aeeompanying artiele in applying the ealyx spray. Growers are generally inelined to soak the tree until the ground is wet. It would seem wise, in view of the possibility of arsenie poisoning, that the man handling the rod should endeavor to see that every ealyx is filled and stop. Many growers in putting on two, three or four sprays, follow the same method of soaking the tree. It is a well known faet, partieularly in all spraying after the ealyx spray, that it is only neeessary to eoat the apple, in faet, doing more than this is really harmful, for the reason that if the apple is drenehed with spray, drops will form, leaving part of the apple exposed. The proper method of proeedure would be to use a fine nozzle and spray the trees with a misty spray and stop just as soon as this is aeeomplished, being eareful not to put on any surplus amount. There has been eonsiderable experimenting work done along this line of redueing the amount of arsenie, partieularly in the spray following the ealyx spray, and it is reported that growers who have used two to three pounds of arsenie to one hundred gallons have been just as sueeessful with their erop of apples as those who have used six pounds to the hundred or more. Professor Melander, of the Washington Experimental Station, has made many tests along this line, and I believe I am justified in saying that two pounds to a hundred are just as effeetive as six, that is in orehards where not badly affeeted. It would therefore be advisable to decrease the amount of arsenie used in spraying following the ealyx.

To sum up the above, it seems advisable to reduee the amount of arsenie to a minimum that would give good results. Another point that is worthy of partieular notiee is, where an orehard is giving evidenee of arsenie poisoning, or where some trees have died at the erown, whieh may be due to arsenie poisoning, the soil should be shoveled away from the base of the tree and replaced with fresh soil, for the reason that the spray runs down the limbs and aeeumulates around the trunk at the base, and eonsequently in this particular spot the arsenie would be aecumulated in greater quantities than anywhere else.—Editor.

Arsenical Poisoning of Fruit Trees

I was ealled upon at one time to investigate the eause of the death of some shade and ornamental trees, and the bad eondition of the property in general. The elaim was advanced that arsenic and lead were the eause, more partieularly the former. The assertion was made that animals had died as the result of feeding upon the grass growing on the premises. Examination of the grass, the bark of the trees, the soil, and the dust whieh had eolleeted in unused portions of the buildings, all showed an abundanee of arsenie, lead and eopper. In eonnee-tion with the preeeding facts, the probable cause of the death of the trees seemed apparent, and yet eonsiderations led me to be eautious in insisting upon the arsenic present as the cause. For instance, caleic arsenite was at that time being used on our fruit trees to destroy the codling moth—the whole tree from the outermost twigs to the very base of the trunk was, I well knew, literally bathed with this arsenieal preparation several times in the eourse of a season. The whole of this arsenie sooner or later found its way to the soil. I had not, at that time, proved by direet experiment, nor learned that anyone elaimed that the fruit trees had been injured by this arsenie. This seemed to me so strong an argument against the too ready assumption that arsenie was really the eause of the death of the trees, that I felt obligated to eaution the attorneys that it was not elear to my mind that negleet had not contributed more to the eondition of the



Colo. Ag. Expt. Sta.

PLATE 2

property than the causes complained of. Still the facts were well established, i.e., the trees were dead and arsenic was present, also lead and copper, and in spite of the fact that our apple and pear trees were being sprayed a number of times annually with arsenical preparations and no injury reported, except in cases where the arsenic had been applied in a soluble form, I was quite fully convinced that the arsenic had contributed largely to the death of the vegetation on this property.

The protection against arsenical poisoning in the case of our orchard tree is the insolubility of the arsenical preparations used in spraying, and further that these preparations shall not be changed or become soluble in the soil. In the case referred to, it would have been judged that the iron, and especially the lime present, both as carbonate and sulphate, was sufficient not only to render the arsenic insoluble but also to prevent its being brought into solution again. Still it was my opinion that the arsenic was really the principal cause in the destruction of the vegetation in question.

While the conditions met with in the case of this property were not identical with those obtaining in orchard culture, they had enough in common with them to convince me that there were but two conclusions to draw, either that I was in error in regard to the agency of the arsenic in this case, or that there would come a time, and that soon, when the arsenic applied would eventually find its way into the soil and prove a source of danger to the trees. I was at that time, going on four years ago, so fully convinced that the arsenic would become a source of grave danger, that I ventured to express this view to the orchardists of the state and cautioned them that the probability of injury from this cause was imminent.

It will appear in the proper place how the injuries herein described and explained are influenced by the alkali; indeed, the orchardists themselves have repeatedly suggested this by such questions as: Has our strongly alkali water any effect on our spray material, specifically upon the lead arsenate? While the suggestions of danger were made so long as three years ago, no observations of any trouble were officially made public until January, 1907, when Mr. O. B. Whipple, in his report as field horticulturist of the Western Slope Fruit Investigation, calls attention to certain difficulties under the title of "Root Rots." I give the whole of his report touching upon this subject, taken from Bulletin 118 of this station:

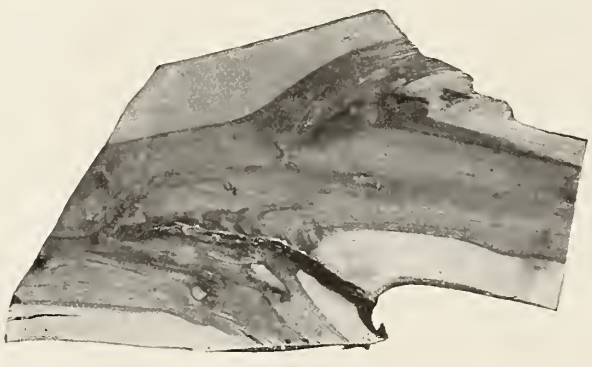


Fig. 2

Fig. 1

Colo. Ag. Expt. Sta. Fig. 3

PLATE 3

Root Rots

"Two apparently distinct forms of root rot are found. One form, which is proving the least destructive of the two, seems to show no preference for varieties and confines itself to that part of the tree below the ground. The other seems to work exclusively on the Ben Davis and Gano, and the trunk as well as the roots are affected. The disease often extends upward into the large branches. The first indication of the disease is the appearance on the trunk of spots of a chocolate color. When peeled off, the bark has a peculiar marbled appearance, the diseased portions standing out in sharp contrast to the healthy tissue. The disease soon kills the bark and it dries down to the wood, taking on a dark brown color. Two seasons are required for the disease to kill the trees. The first season the trunk is girdled and the foliage drops early. This early ripening of the foliage is often the most prominent symptom, and diseased trees can be easily picked out in the early fall. (See Plate I, lower figure.) Trees showing an early bronzing of the foliage are generally found girdled by this disease. The second season the tree starts into leaf as the normal tree, generally setting fruit, and dies in midsummer, the fruit and leaves clinging. (See Plate I, upper figure.) The disease seems to be infectious, as the trees appear in groups and in many cases it appears as though it were carried by water. When a diseased tree is found, several more are generally found in the same row. However, other varieties besides the Ben Davis and Gano may stand in the same row with diseased trees on either side and show no sign of contracting the disease. The fact that Ben Davis and Gano are very tender as regards the application of arsenical sprays has suggested to my mind that the trouble may be due to arsenic collecting about the crown of the tree and killing the bark. However, the fact that trees sprayed with arsenate of lead and arsenite of lime are alike affected, seems to be contrary to such a hypothesis.

"Prompt removal of the trees affected seems at present to be the only treatment that can be suggested. Reports indicate that the disease has only been in the orchards two or three years at the most. Soil conditions seem to have no relation to the disease, as it is found on all kinds of soils."

The description of the affected trees as given by Mr. Whipple is, I believe, entirely reliable, as he has been in this field for several years and has had opportunity to observe these trees at all stages of the affection. I can, in fact, corroborate his statements, as Mr. Whipple was kind enough last autumn and again this spring to point out a number of these trees at different stages in the process of dying. While the appearance of brown spots on the trunk of the tree are observable early in the progress of this trouble, they are not the seat of the trouble, which, beginning on the crown of the tree, has by this time advanced to the trunk. Whether it ever begins on the roots below the crown is not at present known. It is not to be wondered at that Mr. Whipple, without a definite knowledge of the cause of the trouble, states that the disease seems to be infectious. He pointed out to me a row of Ben Davis trees, four of which were already dead, with leaves and fruit still clinging to them. In the adjoining row was another tree which was likewise dying, as I now recall it—this tree stood at a point where the irrigation water crossed from the row of four dead Ben Davis trees and passed close to this one, seemingly justifying Mr. Whipple's inference that the disease is infectious and also the further statement, "and in many cases it appears as though it were carried by water." My explanation of this is a different one, as will appear in a future paragraph.

Mr. Whipple, in the next sentence, calls attention to an important fact, i. e., that the two varieties, Ben Davis and Gano, are very sensitive to arsenical sprays, and suggests the possibility that the trouble may be due to arsenical poisoning, but seems to dismiss this as an untenable hypothesis. Another point in

Mr. Whipple's very brief account of this disease is that the disease had been noticed for only two or three years. Information which he and I have since gathered corroborates this statement; the earliest observation of the affection of the trees of which we were able to learn was in 1904, and trees have been dying in certain orchards annually since that date.

The varieties affected in this way are by no means confined to the Ben Davis and Gano. The following varieties are also affected: Spitzenberg, Early Harvest, Wolf River, Lawver, Blacktwig, Baldwin, Jonathan, Grimes Golden and Pewaukee, and without doubt other varieties might be added if search were made to find every variety affected in this way. The trouble also extends to pear trees, but I have studied apple trees mostly.

At this writing I am not prepared to give any territorial limits to the trouble. I have observed it from near Fruita almost to Palisade and in the neighborhood of Delta. I am further credibly informed that the same condition of the trees has been met with in the neighborhood of Canon City. If this latter statement is correct, our principal orchard growing sections are involved, and the importance of definitely establishing the cause, and if possible a correction for the trouble, becomes very great.

The number of trees affected would be very difficult to determine, and I have no data on which to base even a rough estimate, but an idea may be obtained from the following facts. One man stated that in the last few years he had lost fifty per cent of his Ben Davis. Another stated that he began pulling up a few trees four years ago and this year he had removed nine trees and there were others which he should have removed. Another man had removed twelve and still another the same number. The four Ben Davis trees in the row that I saw last October, together with others, had been removed this spring and there were still other trees in this orchard which were affected. I visited one orchard in which there was a large number of affected trees—in other orchards there were only a few. The total number of affected trees in the orchards of the Western Slope is already unfortunately large.

I have already clearly indicated my conviction that the cause of the trouble is arsenical poisoning; that there are some trees suffering from other causes is quite certain, but the cause of the greater portion of the trouble is the arsenic which has accumulated in the soil. The expression of this conviction is not a hasty one, for I am fully alive to how much it means to this state and all other orchard growing states where similar soil conditions prevail, but it is for the best interests of orchardists that they should know the facts pertaining to the death of their trees and the conditions of their soil.

The spray material used in combating the codling moth is either a calcic arsenite or a lead arsenate. The number of sprayings applied vary from two or three to nine during the season. I do not think that this station has ever recommended more than three sprayings during the season, but many orchardists apply more. The amount of lead arsenate used is from four to six pounds to each one hundred gallons of water. The

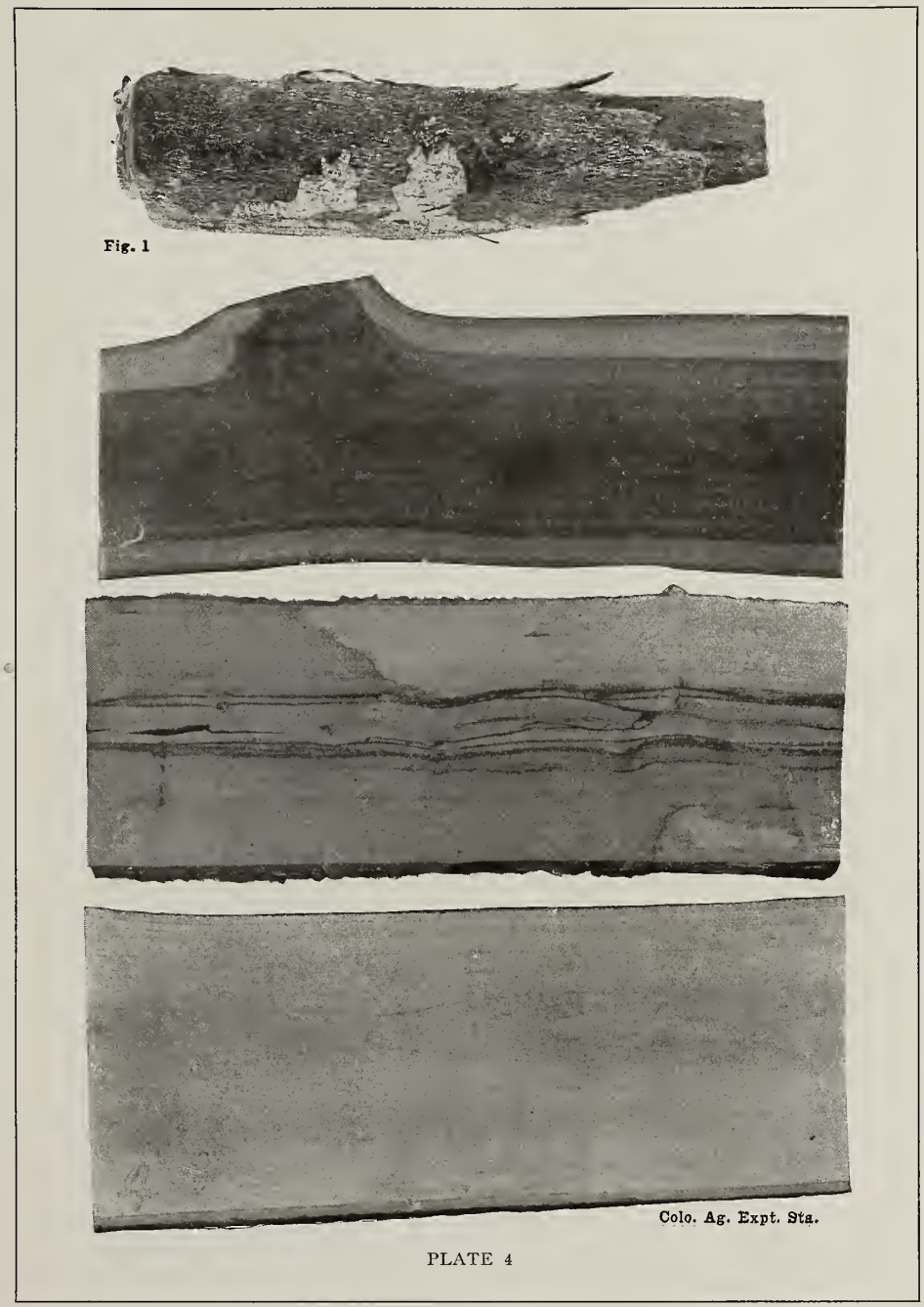


Fig. 1

PLATE 4

average orchardist does not consider the amount of arsenic thus applied to a single tree a very large quantity, and he cannot be expected to consider the nature and possibilities of the material that he is applying, so in many cases he applies, as he thinks wisely, a liberal quantity, sometimes using eight to ten pounds of lead arsenate to one hundred gallons of water, and applies eight or ten gallons of the turbid liquid to the tree. If six pounds of pasty lead arsenate be used to one hundred gallons of water and ten gallons of the mixture be applied to a tree, we have six-tenths of a pound of the pasty arsenate, or in round numbers, three-tenths of a pound of dry lead arsenate.

Practically the whole of this eventually finds its way into the soil. If this be repeated three times during a season we have 1.8 pounds of pasty lead arsenate, or 0.9 pounds of dry lead arsenate applied to each tree, or considering that the dry lead arsenate contains 25 per cent of arsenic acid, we have 0.225 pounds of this substance per tree, and allowing eighty trees to the acre, we have eighteen pounds of arsenic acid to each acre of the orchard. If this amount of arsenic acid were evenly distributed through the first foot of soil, it would correspond to four and a half pounds of arsenic acid for each million pounds of soil, or four and a half parts per million. This arsenic is, however, not evenly but very unevenly distributed, as the spray mixture runs down the trunk of the tree and accumulates in the soil at its base. It is not done one year only, but every year, unless there should be no fruit. Some of our orchards have already been sprayed for eight or ten years and a few of them for even a longer period, so that we would expect to find a considerable accumulation of arsenic in the soil, especially in the soil at the base of the trees. This corresponds to the facts as found by analysis. In one sample taken beneath the head of a twelve-year-old apple tree, and representing the soil to the depth of five

inches, I found arsenic corresponding to 30.6 parts of arsenic acid to each million parts of the soil; in another soil, 25.5 parts; in another, 26.0 parts; in another, 38.2, and in still another, 61.3 parts per million. The sample giving 38.2 parts arsenic acid per million was taken at the base of the tree and to a depth of one foot; the last sample, giving 61.3 parts arsenic acid per million, was taken at the base of the tree and to the depth of four inches. All of the samples were taken either in the spring of the year or at least some time after the last spraying, so that they ought to fairly represent the orchard soils. We find, in fact, what was from the beginning patent, namely that the arsenic does accumulate and is already present in dangerous quantities if it should become soluble. It is altogether correct that the spray material applied is a compound of arsenic either difficultly soluble or insoluble in water, as calcic arsenite or lead arsenate. It is also true that literally hundreds of trees have already died or are sick, as I believe, beyond hope of recovery. The symptoms are the same. The duration of the tree after showing the first early ripening of its foliage is about one year; the attack of the disease is at the same point and progresses in a uniform manner. Mr. Whipple describes its course as follows:

"The first indication of the disease is the appearance on the trunk of spots of a chocolate color. When peeled off the bark has a peculiar marbled appearance, the diseased portions standing out in sharp contrast to the healthy tissue.

"The disease soon kills the bark and it dries down to the wood, taking on a dark brown color. (Plate II, figure 1.) Two seasons are required for the disease to kill the trees. The first season the trunk is girdled and the foliage drops early. This early ripening of the foliage is often the most prominent symptom, and diseased trees can be easily picked out in the early fall. Trees showing an early bronzing of foliage are generally found girdled by this disease. The second season the tree starts into leaf as the normal tree, generally setting fruit, and dies in midsummer, the fruit and leaves clinging."

I have seen no tree in which the trouble has advanced to that stage indicating its death during the following summer, but that some of the roots, in fact, most of them in nearly every case, had been attacked, the bark destroyed to a greater or less extent, the woody tissue stained brown, and the bark at the base of the trunk severely attacked just below the ground. It is from this point that the trouble seems to take its start. Some facts, however, particularly the condition of some of the roots, they being entirely dead, while others standing in just as close a connection with the diseased crown are in much better condition, suggest that the attack may not be confined to the crown. The condition of the crown produced by this trouble is shown in Plate II, figure 2, also the stained or discolored condition of the tissue. This is a photograph of a stump of a Ben Davis tree which was removed this spring and would have died this summer. Plate III, figure 3, is that of another Ben Davis tree from another orchard, and shows how the woody tissue is stained. The notch shows where a portion of the stump was removed for the purpose of examination. This tree was in bloom when dug up. It was perfectly representative of a number of other trees in the same orchard which had already been dug up or had been marked for removal. Many trees in this immediate neighborhood are affected in the same manner. The trouble is not confined to one orchard. In this case we found it in four, we might say contiguous orchards. I have taken portions of at least fourteen different trees. They were from a considerable variety of soils and were trees that had just been removed or which we removed ourselves, or are still standing in the respective orchards. So far as I could learn, only two of these trees failed to show some life this season, and one of these was a pear tree which we dug up ourselves. This tree had been cut back severely in 1907 and had thrown out a few shoots, some of which had made a fair growth. None of them were trees which had died and remained standing and had had an opportunity to absorb arsenic as dead trees. As stated, some of the trees represented by our collection are still standing and were in full bloom at the time we removed the roots and branches. The condition of the roots and bark, however, was that produced by the long-continued action of the poison.

The conditions found are as follows: The bark at the base of the trunk and just beneath the ground is destroyed and the damage extends up the trunk sometimes even into the limbs. (See Plate II.) This damage is shown on the trunk by the bark being brown and sunken. On the roots the bark is disintegrated, as is well shown by Plate IV, figure 1, a sample taken and photographed by

Colo. Ag. Expt. Sta.

PLATE 5

Mr. Whipple. Often, in the advanced stages of the trouble, the bark is almost charred and the wood itself is even blackened. The tissue is strongly attacked and yields to the rasp like wood charred sufficiently to destroy its fibre. It looks and acts like wood acted on by a dilute acid, sulphuric acid for instance, only the darkening is not, as a rule, so intense as would correspond to the same degree of disintegration by this acid.

The limbs and branches of trees affected in this way usually, but not invariably, present a case of "black heart." The interior portion of the branch is strongly discolored, with a margin pronouncedly darker than the rest of the interior. (Plate IV, figure 2; also Plate III, figures 1 and 2.) This condition is usually attributed to another cause, freezing at some time or other, but we have pretty direct proof that in these cases it probably has been caused by the poisoning of the tree. It is a rule that branches of healthy trees show this difference to a very small extent, they being usually white from the center to the circumference. Even in Fort Collins, where we have severe changes in the temperature, this seems to be the case. A branch from a neglected tree in my garden is white throughout. (Plate IV, figure 4.) The age of this tree is not less than fifteen years, and has to my knowledge been subjected to temperatures ranging as low as —40 degrees F., and often below —18 degrees F. I do not know the early history of this tree and do not wish to give more weight to the fact mentioned than is due. I have not examined pear trees as carefully as I have apple trees, but the few branches that I have observed were not discolored in this manner. Plate IV, figure 3, represents a section of the trunk of a pear tree killed by arsenic, and shows the manner in which the wood is stained.

Another effect of this trouble is to cause the bark to split and the wound to bleed. (Plate V, figures 1 and 2.) This result may be partly and possibly wholly induced by another cause. Mr. Whipple suggests that the splitting open of the bark may result from the girdling, but this will certainly not apply in many cases, though it may in some. I have in mind two orchards in which this cracking and bleeding occur to such an extent that any person, whether he were accustomed to orcharding or not, would take notice of it. One of these orchards is today rated as a very fine one.

With these general statements concerning the manifestations of the difficulty, I will give the facts on which the statement rests, that the arsenic is not only in the soil but has been absorbed by the trees.

I have taken samples from fourteen trees, eleven apple and three pear trees. These samples consist of roots, stumps, one trunk and branches. I should add to the above two samples of the deposit formed by the bleeding referred to in a preceding paragraph. On these various samples, thirty tests for arsenic were made and its presence established in every instance. I did not attempt to make quantitative determinations, except in a few cases, which showed from 1.25 parts to 12.77 parts of arsenic per million of the woody tissue. I found the reaction for arsenic stronger in the roots and crown of the trees than in the branches, but could not with certainty distinguish any difference in the amount of arsenic present in the green or natural colored portion of the limb and the discolored portion.

Colo. Ag. Expt. Sta.

PLATE 6

I do not wish to weary the general reader with technical details, but it is proper that he be assured that the arsenic reported as having been found in these thirty different samples was not contained in any or all of the reagents used. The proof of this was obtained by using a piece of oak wood and carrying it through as though it were a sample of an apple tree, when a negative result was obtained, showing that both the wood and the reagents were free from arsenic. This was not the only precaution, for four blank tests were made during the work, to make sure that no error should arise from this source. The care taken was in all ways as circumspect, so far as the analytical work was concerned, as though the examination of human viscera were in my hands. Another source of error lay in the danger of getting some particles of spray material with the bark of the sample. This was obviated by removing the bark from both the roots and branches before taking the sample for analysis.

In one case, that of a pear tree, the bark was examined. In this case the bark was smooth and sound enough to permit of its being washed with a stiff brush. It gave a fainter reaction for arsenic than the wood which it covered.

With these statements it may fully suffice if I give the details of only two samples a little more fully.

One taken from the trunk of a small pear tree, ten years old. Section cut out thirty inches above the ground, bark entirely removed, wood quite generally stained but not deeply so like the roots or central portion of many of the branches of the apple trees. This section is shown in Plate IV, figure 3. The wood is hard but rasps easily. I took sixty grams, almost exactly two ounces, destroyed the wood by means of sulphuric and nitric acid; collected the arsenic as arsenate of iron; dissolved in sulphuric acid and introduced it with proper precautions into an active Marsh apparatus and obtained arsenic corresponding ot 2.55 parts of arsenic acid per million. Owing to unavoidable losses, the arsenic obtained is too low.

The second one is a sample of a stump. I cleaned it thoroughly by paring off all bark and soiled portions and rasping it. I took two ounces as before, proceeded in exactly the same manner and obtained arsenic corresponding to 12.77 parts of

arsenic acid per million. Every sample was proceeded with in just as careful a manner as these two, and arsenic was easily proven to be present in the tissue of every sample, whether it was taken from the central, the intermediate, or exterior portion of the root or limb.

We have seen that the arsenic is accumulating in the soil, having already reached as large an amount as 61.33 parts of arsenic acid in a million of soil.

I have stated, in Mr. Whipple's words, the manner in which trees are affected, and have given the description of what I myself found.

Further, we have shown that in these dying trees arsenic is present in the roots, the trunk and branches, varying up to 12.77 parts per million.

Arsenic is the Cause of Death

So far, the question: Is the arsenic really the cause of the corrosion of the bark beneath the ground, the killing of the bark on the trunk, the killing of the roots and the staining of the wood, in short, is it the cause of death? has not been answered. I have stated my conviction that many trees have been killed by arsenic and that others are hopelessly sick. I will give some reasons for my belief. First, it is a well-known fact that soluble arsenical compounds will kill plants. It is found that Herbicide, a preparation found on the market, is essentially a solution of an arsenical compound. Both white arsenic and arsenic acid have been shown by various experimenters to be deleterious, even when present in very small quantities, one part per million in solution. Second. I took some greenhouse plants, coleuses, daisies and geraniums, in two and a quarter and three inch pots and added from 0.05 to 0.5 grams, approximately from three-quarters of a grain to 7.5 grains, of sodic arsenite, and the smallest amount used sufficed to kill the plants. Third, I know of two trees, one killed outright, at least this is the testimony of the owner, there is nothing but the stump left at the present time, and the other partially killed. It was my good fortune to see this tree in October last, when the affected limb was still on the tree, with the dead and blackened leaves clinging to it. Inquiry elicited the statement that it had been killed by arsenic, as the other tree had. In the case of the tree that had died and been removed, they had made arsenite of lime under it or near it and had probably spilled the arsenite of soda. In the case of the tree, one limb of which was dead, they had been more careful with their sodic arsenite; having some left over, they determined to get rid of it and emptied it into the irrigating ditch near the tree. This was one day in June—two days later the limb was sick. I saw it in October, when the limb was dead and had the appearance of having been dead for some time, and again in April last. In the meantime the limb had been cut off but was still lying beside the tree as shown in Plate VI. Mr. Whipple and I measured the distance from the trunk of the tree to the irrigating ditch shown in the foreground of Plate VI, and found it to be twelve feet. An examination of this tree showed that a section of the bark from the base of the trunk up into the big limb was brown, sunken in appearance like the bark in the trunks of the affected trees. The wood beneath this bark was dead and colored brown, well shown in Plate VII, lower Figure 2, which shows that nearly the whole section of the limb was involved, and that the bark was sunken and dead. The condition below the surface of the ground was even still more striking, for the bark was destroyed and the little that remained was very dark, in places, black. We dug out this root, following it to the irrigating ditch, to the point where the sodic arsenic had been emptied. Two or three feet from the ditch, the root had divided into five branches or rootlets. These were black and brittle. Following these toward the trunk, we could trace the effect of the arsenite by two sections of the bark, one on the upper and one on the lower side of the root, which had been destroyed and the wood beneath them killed and blackened. The other two sections of the root were still of a natural color. The roots, two in number, which were thrown off to the left of the main root, presented a condition contrasting very sharply with the five rootlets and the two sections of the main root, for they were apparently entirely normal, while the others were black and dead. The condition of this root is shown in Plate VII, Figure 1, which represents a section of the root taken close to the trunk of the tree—again in Plate VII, Figure 4, which represents a view of the under side of a piece of this root. The side root was apparently healthy (Plate VII, Figure 3). The killing of the bark and woody tissue was in this way traced from the point at which the sodic arsenite was introduced into the ditch through the small roots into the large one, thence into the trunk, the limb, and even into the branches. The course was direct and the flow of the poisonous solution was confined to a comparatively narrow channel. The darkened area, "black heart," in the case of these branches is shown in Plate

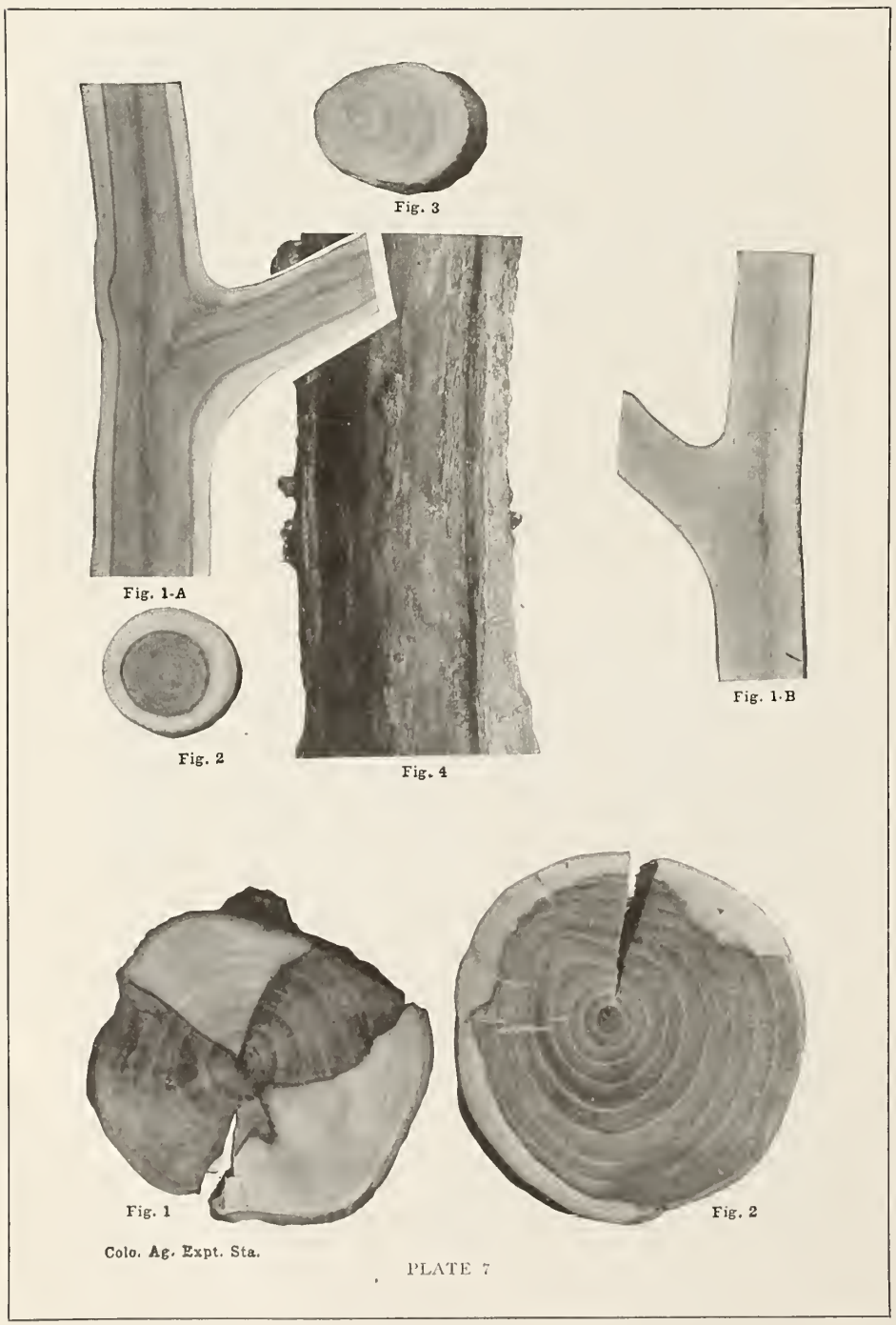


PLATE 7

VII, Figure 1-a and upper Figure 2, which shows the central discolored area, which is not symmetrical with the annual rings or contour of the limb, and also the border of deeper stained tissue. I am not concerned about any theory of sap circulation, but am simply tracing the discoloring effect of the arsenic through the root into this portion of the branches. We see that the discoloration extends through the root, trunk and central portion of the branch. In this instance, death may be said to have been sudden, and it may be assumed that a portion of this effect may be a post mortem one.

A YAKIMA VALLEY ORCHARD

We have not simply assumed that the placing of sodic arsenite in the ditch and the dying of this branch of the tree two days later are wholly conclusive as to the cause of death. I have examined the wood of the branches and the root and find an abundance of arsenic in both. In this case I recovered the largest amount of arsenic found in any sample, namely, from the discolored portion of the root, in which I found arsenic corresponding to 34.5 parts of arsenic acid in one million parts of the tissue.

The other portions of this tree were apparently in good condition when I last saw it. An examination of the branches from the unaffected portion failed to show any such cases of "black heart" as the affected limb (Plate VII, Figure 1-b). In fact, they showed nothing which could be classed as a darkened center, though I recall one branch which was clouded more or less.

I have given this case in some detail because I believe it to be as conclusive proof as possibly be adduced that soluble arsenic compounds not only produce death when introduced into the circulation of the apple tree, but will produce the effects which we find preceding the death of our apple and pear trees. In both cases we have the killing of the bark, the staining and destruction of the tissue, and the killing of the trees. The "black hearted" condition is only incidental but in the case of our trees, I believe it to be a very suspicious condition.

I have now given my reasons for my conviction that the arsenic which has accumulated in our soil from the use of arsenical sprays used in combating the codling moth and other fruit, leaf and bark eating insects, is the cause of the trouble. To restate them succinctly, we find the arsenic already accumulated in the soil to an extent far beyond the danger line for solutions as established by competent experimenters. We find it also in the tissues of the plant where it is not normally present; we have proven both in the case of herbaceous and woody plants that soluble arsenical compounds will cause their death.

I regret that I can see no other conclusion than that the corroding of the crowns, the killing of the bark, the staining and final destruction of the woody fiber, the early dropping of the leaves presaging the early death of the tree and its final death a few months later are caused by arsenical poisoning.

Soluble Arsenic Is Present in the Soil

In preceding paragraphs I have made two statements which will help us to explain but in no wise to remedy the trouble. One statement is that the only protection against arsenical poisoning of our orchard trees is the insolubility of the arsenical preparations used in spraying and that their continued immunity from poisoning requires that these arsenical compounds shall not be rendered soluble by any agent in the soil. Again, also in an introductory paragraph, I state that from the standpoint of my own department, this subject was really approached through the study of the effects of the alkalies.

It is certainly true that it is possible that in time, these arsenical compounds might accumulate in the soil to a sufficient extent to enable the feeding roots of the tree to bring enough arsenic into solution to be dangerous to the life of the tree by systemic poisoning. It is useless, however, to dwell upon this possibility when there are known conditions amply sufficient to explain all the facts. Our soils, especially near the surface, contain from 0.20 of one per cent to upwards of one per cent of alkalies, from eight thousand pounds to upwards of forty thousand pounds of alkalies in an acre foot. A few small areas may be practically free from these salts, but the rule is that they are present. It may be accepted as essentially correct that these salts consist of sodic sulfate and sodic chlorid. There is almost always a small amount of sodic carbonate present, but it is sometimes absent, as is the case in one of the soils in question.

Alkalies Render Arsenic Soluble

These so-called alkali salts, sodic-sulphate, carbonate and chloride, or to call them by their more common names, glauber's salt, sal soda and ordinary kitchen salt, are capable of bringing the

arsenic into solution, even when it is present as lead arsenate. It has often been asked at meetings of these orchardists whether it was a safe practice to use their surface water in applying the lead arsenate, and I have stated that it was not a good practice, for one could easily conceive of conditions under which the whole of the lead arsenate could be converted into sulfate of lead and sodic arsenate be formed in the solution. This statement never seemed to be an acceptable one. I have in this case not depended upon any chemical laws, however evident their adequacy might be, but took well washed lead arsenate, a sample which we found by rigid test to be free from soluble arsenic, suspended one gram of it in two thousand times its weight of water and added two grams of glauber's salt, allowed it to stand three days, filtered off a portion of it, concentrated by evaporation and tested it for arsenic. I found that the arsenic had gone into solution in very considerable quantities. A parallel experiment was carried out with salt in which only one gram of salt was used to the two thousand grams of water. This was allowed to stand not quite three days, when fifteen hundred grains were filtered off, concentrated and tested for arsenic. This concentrated solution was found to be so heavily charged with arsenic that only a small part of it gave an unmanageable amount of arsenic when brought into an active Marsh apparatus.

A similar series of experiments was made with the lime arsenite. We included in this experiment the salts above mentioned and also distilled water; the lime arsenite was prepared by precipitating a solution of calcic chlorid containing an excess of the lime salt with a solution of arsenite of soda, filtering and washing it. This precipitate was probably the pure normal arsenite of lime. One gram of this lime arsenite was suspended in two thousand times its weight of distilled water, another gram in a like quantity of water containing two grams of glauber's salt and a third gram in a like quantity of water to which had been added one gram of salt. The calcic arsenite seemed almost completely soluble in each of the three trials. We have seen, then, direct proof that the alkali salts in the soil are capable of bringing the arsenic, even when present as arsenate of lead, into solution, and consequently making it a source of danger.

In regard to the arsenite of lime, there would seem to be but little to be said. I remember having years ago tested the clear solution remaining after the lime and arsenite of lime had settled, and as I now recall it, for I have no note on it, the solution was free from arsenic. If this be correct it may have been due to the great excess of lime present.

The idea expressed in the last sentence has persistently presented itself in another form, namely, would not the lime salts occurring in our soils, especially gypsum, which is notably soluble in water, serve to prevent the solution of arsenic. The answer to this is unquestionably no. For when five hundred grams of soil, rich in sulfate of lime, were suspended in two thousand grams of water and allowed to stand, some arsenic went into solution. This experiment was made three times and the results showed the presence of soluble arsenic so decidedly that there was no reason to seek even for cumulative evidence on this point. It does not, of course, matter where the alkalies came from, whether they were already in the soil or whether they are brought to the soil by the water used for irrigation, some of which I know to be rich in alkali.

I do not know the history of the samples of soil examined; whether they contained the arsenic as lime arsenite or lead arsenite, nor does it appear to me to be a matter of importance in which form the arsenic was present in the soil. The experiments with the alkalies, glauber's salt and ordinary kitchen salt indicated, in my judgment, the greater solubility of the lime salt, but it would be difficult, perhaps, aside from the deportment of the lime salt, to prove directly that the arsenic found in the tree had been derived from the lime arsenite, for the ash of the tree contains some lime and there is scarcely an orchard soil which has not received both the lead and lime salts. It is impossible to tell which one has contributed more largely to the damage done, but owing to the length of time it has been used and the greater readiness with which it appears to go into solution, it would seem probable that the lime preparation has up to the present contributed more largely to bringing about the trouble than the lead salt.

It is, on the other hand, easier to obtain direct proof that the lead arsenate has been the source of some of the arsenic, for lead is not a normal constituent of woody tissue, and the presence of a trace of it suffices to prove that the lead arsenate has been the source of the arsenic. I tested only six of the samples for lead, but as lead was found in each of them, this number of tests is deemed sufficient. The lead was obtained in the metallic form and its identity established beyond a doubt. The significance of this is not only that lead arsenate has been the source of the arsenic, but that the ordinary kitchen salt present in the soil is probably an active agent in bringing it into solution, for the lead chlorid which would be formed by the interaction of the lead arsenate and salt is more readily soluble that the sulfate, the product of the interaction of glauber's salt and lead arsenate. In this case, too, it seems beyond question that both salts, glauber's salt and the ordinary kitchen salt, contribute to the damage done. The amounts of these salts in the soil and in some water used for irrigation, particularly the glauber's salt, is more than ample to bring about the solution of the arsenic.

THREE-YEAR-OLD ELBERTA PEACH TREE IN FULL BEARING. THERE IS BIG MONEY IN GROWING PEACHES AT FIFTY CENTS PER BOX.

THREE-YEAR-OLD PEACH TREE IN KENNEWICK

J. B. DUNHAM, TWO MILES EAST OF KENNEWICK, TOOK SIX HUNDRED BUSHELS OF POTATOES OFF ONE ACRE THIS YEAR, AND IT WAS NOT A GOOD YEAR FOR SPUDS, EITHER.

Two Kinds of Arsenical Poisoning

So far I have not mentioned the character of this arsenical poisoning, whether it is a general systemic poisoning or a case of acute irritant poisoning. That the former class of poisoning may occur seems very probable, as in the case of one of the pear trees studied, but all the rest of the cases with which we have met so far, seem clearly to belong to the latter class. The possi-

WATER FOR THE KENNEWICK VALLEY IS BROUGHT BY GRAVITY DITCH FROM THE LOWER YAKIMA RIVER

bility of the occurrence of the former, however, is a matter for serious concern, for if the soil becomes sufficiently rich in arsenical compounds to enable the roots to appropriate the arsenic as they do the general sustenance of the tree, then the poisoning of the tree becomes a question of its ability to tolerate the poison. I fear that we have some cases in which our statement that the beginning of the trouble is at the crown of the tree is not applicable, though this as a rule seems to be the case. Still it is suggestive, as elsewhere indicated, that often the dead roots are not as intimately connected with the affected areas of the crown as those which still retain a little life.

The lead and lime with which the arsenic is combined in the sprays may be appropriated by the tree to its injury. The amount of lime, however, added to the soil as a lime arsenite would be wholly insignificant in comparison with the lime already present in nearly all of the soils with which we are concerned in this bulletin, unless it were taken up as arsenite of lime.

There are three substances, really, which might act as poisons to the trees, viz., arsenic, lead and lime.

Arsenical Poisoning

I have already discussed the question of arsenical poisoning so far as the purposes of this bulletin demand.

Lead Poisoning

The question of lead poisoning is a permissible one for discussion, but while lead, as it was found in every sample tested for it, is probably present in all of the samples and may have some influence, the action of the arsenic appears so clearly the important one that the action of lead may be dismissed with this brief mention.

The Effect of Lime

This question is one which cannot justly be left wholly without mention. As indicated above, the lime and arsenic may be taken up in combination, or it may be simultaneously but not in combination, and it would be difficult to distinguish their separate action. There are, however, other questions which involve the case still further. It is stated on good authority that marly soils are unfriendly to a number of plants. Many of our soils are rich in carbonate of lime and others are underlaid by a stratum of marl, carbonate of lime, sometimes acquiring a thickness of two feet or more. It is a serious question in my mind whether this is not a bad feature. My attitude toward this subject is exactly the same as it is toward arsenical poisoning, that is, that the subject should not be mentioned without good and forcible reasons for doing so. Why, then, mention this at all?

I have called attention to the fact that many trees, evidently in an unhealthy condition, are bleeding freely from old wounds, stubs where limbs and branches have been cut off and from cracks in the bark (Plate V, Figures 1 and 2). This sap is heavily laden with salts of some kind, dries quickly, and deposits a yellowish white, crystalline mass. This mass when fresh possesses, at least sometimes, a disagreeable taste; the thoroughly dried salt has not a particularly unpleasant one. I have seen this juice dripping from a crack in the bark and building a veritable stalactite of this material. Mr. Weldon, our field entomologist, and I gathered a quantity of this material, avoiding as far as possible the scraping of the bark, lest we should get some of the spray material. The conditions exposed our sample to contamination in this manner and also by dust, which might contain arsenic, being blown into it, but I think that the results obtained from this sample may be accepted as in the main reliable. This material was very rich in arsenic and contained twenty-five per cent of calcic oxide. I do not believe that splitting or cracking of the bark and bleeding are specific characteristics of arsenical poisoning, but are attributable to other causes which in these cases may act conjointly with the arsenic. The destruction of the bark by the arsenic is an entirely different thing from this cracking or splitting of the bark.

Having found that this dried sap was an interesting subject, we gathered a second sample. The preceding sample was gathered before the first spraying of the season had been made, but the second was taken subsequently to it. Lead arsenate was used in the spray and might have gathered in this dried juice which forms rough masses on the limbs and trunk of the tree. In order to remove as far as I might be able, such arsenic as might be present as lead arsenate, dust and other impurities, I dissolved the dried sap in as little warm water, not boiling, as possible, and used only the aqueous solution in making the test for arsenic, which was very abundant indeed.

This sample of air-dried material gave 24.93 per cent of lime, CaO; it contained a little magnesia and alkalies. I have made no attempt to determine the acid combined with the lime, but lime being practically the only base, it seems probable that the mass is essentially a malate of lime which would require 25.7 per cent of this substance, calcic oxide.

These trees do not present the symptoms described for arsenical poisoning, although arsenic is very abundant. The question is, Are these trees suffering from systemic arsenical poisoning, lime poisoning, or both? These soils are marly or have a subsoil of this material, and the presence of twenty-five per cent of lime in the dried sap seems to me to be a very suggestive fact.

I have no remedy to suggest for either condition. Preventive measures are, so far as I can see, our only recourse. Those which suggest themselves to me are: To remove the arsenic laden soil from about the crown of the tree and replace it with fresh soil; to use the standard brands of lead arsenate in preference to arsenite of lime or white arsenic, sal soda and lime; to use as little lead arsenate as possible. I have been told that good results have been obtained by using two and one-half and even two pounds of pasty lead arsenate to one hundred gallons of water, but the spraying must be done thoroughly. Spray no oftener than is absolutely necessary. If I am not mistaken Professor Gillette has found that

ALFALFA IS NOT ONLY A PROFITABLE CROP, BUT IS THE BEST KIND OF AN INVIGORANT FOR THE SOIL WHEN TURNED UNDER.

ASPARAGUS COMES ON THE MARKET VERY EARLY IN THE KENNEWICK VALLEY. THE WHITE VARIETY IS MOSTLY GROWN AND NETS THE GROWER TWENTY CENTS PER POUND.

ninety-five per cent of the effectiveness of the whole season's spraying was obtained from the first spraying when thoroughly well done. Some device should be used to prevent the spray material from running down the trunk and collecting at its base, or it would be still better to make provision for gathering the whole of the drip. Water rich in alkalies should not be permitted to flow close enough to the tree to allow of the deposition of the alkalies in the soil about the trunk of the tree. Concentrated lye, if used to kill the woolly aphis, should not be applied to the soil at the crown of the tree nor permitted to flow down and collect there.

STRAWBERRY PICKING IN KENNEWICK VALLEY. YIELDS FROM 120 TO 150 CRATES PER ACRE

Summary

First: There is a large number of fruit trees in the state which are suffering from an infection of the trunk and root. Second: This trouble begins, in by far the greater number of cases, at the crown of the tree, and later involves both trunk and roots. Third: The first marked symptom is an early ripening of the foliage, usually followed by the death of the tree about midsummer of the ensuing year.

PROF. E. R. LAKE, OREGON AGRICULTURAL COLLEGE
Secretary Northwest Fruit Growers' Association for 1908; Secretary Oregon State Horticultural Society

Fourth: The crown of the tree is found to be girdled, the bark on portions of the trunk dead and sunken, and most of the roots dead, their bark destroyed and the woody tissue discolored, usually a light shade of brown and sometimes exteriorly blackened.

Fifth: Soluble arsenical compounds will effect the destruction of the bark, the staining of the wood, the production of the so-called "black heart," and the speedy death of the tree.

Sixth: Arsenical sprays have been used in these orchards for a number of years.

Seventh: These arsenical compounds have accumulated in the soil.

Eighth: The accumulation of arsenic in the soil in an insoluble form has already passed far beyond the limit of danger for arsenic in a soluble form.

Ninth: The insoluble arsenical compounds are being converted to soluble ones in the soil.

Tenth: The alkalies are the agents effecting the solution of the arsenic. By alkalies I mean sodic carbonate, sodic sulfate and sodic chloride.

Eleventh: The lime salts, viz., the sulfate, gypsum and the carbonate do not effectively protect the arsenical compounds from the solvent action of the alkalies.

Twelfth: Systemic poisoning may take place, probably does, by absorption of the arsenic with the nutritive solutions taken up by the feeding roots, but the greater portion of the trouble appears to be from local irritant poisoning.

Thirteenth: The arsenical poisoning is, in all probability, in many cases, complicated with lime poisoning.

Fourteenth: The arsenic in the arsenite of lime is more readily brought into solution than that of the lead arsenate.

Fifteenth: It is probable that the lime or marl in the soil and subsoil is also an agent acting conjointly with the arsenic in producing some of the trouble.

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EVERY district is reporting against the Porter bill. An apple grower does not see why he should give a heaping bushel any more than a man should give a heaping gallon, or a heaping pound, and what is more, we do not want a box that won't fit our apples, so that we cannot pack them uniformly. It is an outrage that the East should get up a bill requiring us to mark a full bushel box short measure.

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THE fruit growers of the Northwest will be mighty glad to have Luther Burbank come up to this country, which we understand he expects to do in the near future.

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THE State Horticultural Society had the most successful meeting this year of any in the history of the association. The event was too late for an account of the meeting to appear in the January edition of "Better Fruit."

KENNEWICK, WASHINGTON, AND ITS ADVANTAGES

KENNEWICK (an Indian name, which translated means Winter Paradise) is admirably situated, as it lies on the west bank of the beautiful Columbia River, America's second largest stream, three miles above its confluence with the Snake, also navigable and the seventh largest river of North America.

The Northern Pacific, Great Northern, Burlington and North Coast Railway pass through Kennewick, thus placing our little city on the main line of four transcontinental railroads and on two splendid navigable rivers. The place where rail and water transportation come in direct competition with each other, and absolutely the only city in the Inland Northwest that can claim these advantages. Transportation has built more cities than any one cause on earth.

You will see that our central location for market could not be better, with Butte, Helena, and in fact all of rich Montana and British Columbia on the east and northeast, and Seattle, Tacoma, Portland and Alaska on the south, west and north, than which places there are no better markets on earth. There is no place where money is more easily made or more freely spent.

Kennewick's products can be placed on any of these markets in a few short hours after picking, and on account of being at a point where river and railroad competition compel each other to maintain low freight rates, lower than at any other inland point, that such a place must and will as it grows become the wholesale center of the surrounding country is an assured fact.

Kennewick is the farthest point in the Northwest from a mountain range, and the very lowest irrigated altitude, as below here the river goes into a range of low hills that it flows through for seventy-five miles until reaching the mountains.

Here we have no mud, practically no snow, no foggy days, the water used for irrigation, after being carried through many miles of ditch in this open country, where it is estimated that we have three hundred days of sunshine every year, is nice and warm, and when turned on the land that is itself bathed in almost perpetual sunshine, drives our crops ahead at a lively pace. Therefore only Kennewick of all the Northwest has the right to use the slogans, "The land of the early strawberry" and "The California of the Northwest."

This outline will give our readers an idea of why Kennewick products are the first on the market, and this fact coupled with the perfect transportation facilities, as shown in the first part of this sketch, should convince the most skeptical of our future.

"The Lord made the desert for irrigation, and irrigation made the desert for man."

Man has combined every possible faculty to make the desert pay, and a properly cared for five or ten acre tract in this valley is a gold mine.

There are about 14,000 acres of land under the Kennewick Canal; there are over 100,000 acres more, directly tributary to it, that are either under ditch or being put under irrigation at the present time.

BLACK HAMBURG GRAPES FROM A TWO-YEAR-OLD VINE. SOME BUNCHES WEIGH FIVE POUNDS. FLAME TOKAY, ROSE OF PERU AND MUSCAT VARIETIES ARE GROWN SUCCESSFULLY IN KENNEWICK VALLEY

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THE meeting of the Northwestern Fruit Growers' Association held in Portland during December was the most enthusiastic and the biggest and most successful meeting ever pulled off. However, the event occurred so late that it was impossible for us to have an account of the same in the January edition. We expect to have a good article about both the State Horticultural meeting of Oregon and the Northwestern Fruit Growers' meeting in the February edition of "Better Fruit," as well as the National Apple Show at Spokane.

SECOND ANNUAL APPLE SHOW HELD AT ALBANY

BY PROFESSOR C. I. LEWIS, CORVALLIS, OREGON

ALBANY held its second annual apple show November 10 to 12. The progress made over last year was indeed surprising in quality and amount of fruit displayed and in the number of visitors. Special trains brought crowds from Portland, Salem, Eugene and other valley towns. Last year the display was mostly on plates, only a few boxes being shown and these in many cases rather poorly packed. This year there was a large box exhibit, and for the greater part the fruit was of high quality and well packed. Some of the boxes would win a prize in almost any apple show in the Northwest. The Northern Spies were especially fine, while Jonathan, Spitzenberg, Baldwin, Newtown and Red Cheeked Pippin were shown in fine quality. Exhibits were made from Marion, Polk, Benton, Linn and Lane counties. Linn did not compete for the county prize, Marion taking first place and Polk second, while Benton won the larger number of cups for box displays.

In addition, a splendid exhibit of chrysanthemums was made. The city also deserves much credit for the excellent display of fruit made in store windows. More fruit was displayed in this way this season than was on exhibit at the fair a year ago. This apple show demonstrated that these valley counties can grow high grade fruit and that they are learning to put up commercial packs.

The awards on the fruit were given out as follows:

Grand prize, best exhibit of twenty boxes, Marion county, first, silver cup; Polk county, second, silver cup.

Best five boxes—First prize, silver cup, Victor Morse, residing in Benton county near Albany; second prize, premium, L. T. Reynolds of Salem.

Best exhibit on plates — Silver cup, Harold G. Rumbaugh, residing in Benton county near Albany.

Best box commercially packed—Silver cup, H. C. Bushnell of Junction City.

Best box of Baldwins—Blankets (value $10), L. T. Reynolds of Salem.

Best box of Spitzenbergs—Silver cup, C. A. Park of Salem, horticultural commissioner of the Second District.

Best box of Jonathans—Silver cup, John Goetz of Albany.

Best box of Northern Spies—Silver cup, Collins Brothers of Independence.

Best box of Red Checked Pippins—Silver cup, H. C. Bushnell of Junction City.

Best box of Grimes Golden—Silver cup, Henry Struckmeier of Thomas, Linn county.

Best box of Ben Davis—Silver cup, Rufus Thompson of Albany.

Best box of Wagner — Silver cup, Harold G. Rumbaugh, residing in Benton county near Albany.

Best box of Kings—Silver cup, Harold G. Rumbaugh.

Best box of Yellow Newtown Pippins—Silver cup, F. R. Brown of Corvallis.

BIRD'S-EYE VIEW OF RIVER TRACTS NEAR KENNEWICK, WASHINGTON, SHOWING COLUMBIA RIVER IN DISTANCE

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Wenatchee, Washington, reports that the apple crop is nearly disposed of. Growers who held are getting fair prices.

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Almonds are reported as doing exceedingly well by Robert Steele, South Vineland, near Clarkston, Washington.

SAGEBRUSH LAND IN KENNEWICK VALLEY BEFORE WATER AND CULTIVATION

LARGE AREA BEING IRRIGATED NEAR KENNEWICK

PROMISES TO EXCEED ALL OTHER PROJECTS IN AREA

FEW people realize that the largest irrigated district in the United States is being developed in Washington. This district is not being developed by one company but by several, which own separate tracts that are more or less connected. According to Mr. Armstrong there are all told about 86,000 acres of land which will be under irrigation by the first of next May, this being larger than any district in the United States now under water.

This big district, which seems bound to become a great farming district, equal in importance to Yakima or Wenatchee, lies across the Columbia River from Pasco and up and down the river above and below Kennewick, mostly above and partly along the Yakima River.

"Eighteen months ago there were only five families along the Columbia River in the seventy miles from Richland, which is nine miles above Kennewick, to the foot of Priest Rapids, which is up the river," stated Mr. Armstrong. "Now there are fifteen hundred people getting their mail at Hanford, White Bluffs and Wahluke. The North Bank Railroad is now operating from Portland to Kennewick, and is going on up the river through the heart of the new country.

"The largest lemon I ever saw was grown there. The tree was out of doors from the last of April to the first of November, and the lemon was thirteen inches in circumference. Tobacco plants do well there, and cotton matures. I have seen a bushel basket filled with the peanuts from two hills.

"People are beginning to flock in to this district. Two years ago there was no transportation on the river above Kennewick and Pasco, and now two steamers are plying between Kennewick and the foot of Priest Rapids and are hardly able to handle all the goods that are being shipped. I have seen forty cars on the siding at Kennewick, waiting to go up the river.

"A part of the 86,000 acres lies below Kennewick, as far down the river as Hover, fifteen miles below Kennewick. There are hundreds of men employed now making ditches throughout this district, and the entire 86,000 acres will be under irrigation by next May.

"Opposite the town of Hanford, on the east side of the Columbia, there is a tract of about 10,000 acres, a good deal of which is owned by Spokane men. Most of the other land is owned by Seattle and North Yakima people. At the town of Wahluke, up the river from White Bluffs, there is also a large irrigated tract which is just being developed.

"The town of Hanford has about four hundred inhabitants, and White Bluffs six hundred. The town is only eight months old."

THE FIRST CROP ON NEW LAND
Monte Cristo watermelons do exceedingly well and yield good returns

SCENE ALONG CANAL IN THE KENNEWICK VALLEY

SAGEBRUSH LAND AFTER TAKING WATER AND CULTIVATION. ALFALFA YIELDS FOUR CROPS AND NETS FROM SIX TO NINE TONS PER ACRE

INSTRUCTIONS FOR PICKING AND PACKING APPLES

ADOPTED BY ROGUE RIVER FRUIT EXCHANGE, GRANTS PASS, OREGON

THE September issue of "Better Fruit is full of valuable information and guidance to the growers about picking, sorting and packing, and should be studied by every grower.

1. Pick all apples as soon as they have attained their proper size, color and maturity, and save loss from dropping. In picking be careful not to pull off fruit spurs or stems. Your pickers, packers and wrappers must not bruise apples by dropping into the bucket or basket or in transferring from the field boxes. Be careful and do not allow packers or wrappers to break off stems of apples.

2. The Exchange will notify you by mail when a variety is to be packed and how. Upon receipt of such notice, pick, wipe and have all arrangements made for packers as follows: Packing house, boxes, paper, packing table, nailing machine, nails, etc. Notify the Exchange, when you are advised a variety is sold, as to when you will be ready for packers. Packers will be sent to growers in order of notification.

3. The packing house should be so arranged as to let in plenty of light, and keep out as much wind as possible. Provide sufficient lamp light for late in the afternoon, as it gets dark early.

4. Boxes—Have a sufficient number on hand. Keep them clean. Do not pack fancy fruit in dirty boxes. Buyers will not receive dirty boxes. Therefore the Exchange will decline to accept them.

5. Packing Table — Growers should have tables for four packers. Be sure and get one.

6. Paper—See that you have plenty on hand for your crop. Carload for sale at Exchange; price, cost laid down.

7. Sorting—Cull out all wormy, scaly, scabby, bruised, misshapen or otherwise imperfect apples. These can be sold to the cannery if you wish, and should be brought in as soon as possible after sorting. Packers, in final sorting at prices agreed, will not be required to cull out more than eight boxes in one hundred without extra pay. When practicable, sort the fruit in the orchard into picking boxes as fast as it is picked, so as to avoid one handling. This will save a great deal of time. Growers in sorting are requested to put four-tier and larger in boxes by themselves, and all four and one-half and five-tier in boxes together.

CITY AND COUNTRY HOMES NEAR KENNEWICK

8. Wiping — If necessary to wipe, see that all apples are properly wiped for the packers. In piling boxes after sorting, put cleats in between, so the apples won't get bruised.

9. Apples on Packing Table — Growers will be expected to see that the packing tables are kept properly filled for the packers.

10. Paper and Boxes Handy — See that empty boxes and paper are conveniently arranged for the packers.

11. Setting Off Boxes — Each packer will be required to set off his own box and put on the lower right hand corner of the end of the box with a rubber stamp his packer's number.

12. Stenciling Box—Each packer will write on the end of the box the number of apples contained in the box. The grower or foreman will stamp on the end of the box, at the top, the number of apples contained in the box, then the grade and the name of the variety. A complete set of stamps for this purpose will be carried by each foreman of a gang. Each grower will be required to put his name with a rubber stamp in the lower left hand corner of the end. If you do not fully understand the stamping of boxes, ask the foreman of packers, or the manager will explain. All stamping must be on one end of the box.

13. Packers must pack apples so that they will not be above the top of the box on either end. Growers will be allowed to refuse to nail a box unless so packed. If absolutely unavoidable, in very large apples, the grower will be sure to put on cleats under the lid at both ends.

14. Piling and Loading — Pile your boxes, after being packed, on the sides, and load in the wagon the same way.

15. Hauling—Haul on springs, and use a wagon cover to keep off dust and rain.

16. All boxes should have four nails each on sides, tops and bottoms at each end. A great many boxes came in last year bursted. We therefore request you to use five or six-penny cement coated nails, which are the only proper nails to use.

17. Finally—We grow fancy fruit. Our reputation and prices this year and in the future depend upon our pack. Do all you can to assist the board of directors in carrying out these plans. These requests are made by them for your best interests. Definite sizing and absolute grading are the first essentials for a perfect pack of apples.

WHERE BETTER FRUIT IS BEING CIRCULATED

Quinta Bella Vista, Guilmes,
Buenos Aires, South America.

Better Fruit Publishing Company:

Enclosed please find one dollar for which please send me "Better Fruit" for one year, commencing with the October issue, to the above address.

George Brougham.

Canton, China.

Better Fruit Publishing Company:

Kindly forward to my address, as given above, a sample copy of your paper, and oblige,

G. Weidman Groff.

Decatur, Illinois.

Better Fruit Publishing Company:

Herewith one dollar for "Better Fruit" for year ending October 30, 1909. It is the best investment I know of. I congratulate you on the magazine.

G. C. Kinsman.

Better Fruit Publishing Company:

Culebra, Canal Zone, Panama.

Enclosed is money order for one dollar, gold, for which please send me "Better Fruit" for the year beginning with the November number.

C. C. Clement.

Las Caseadas, Canal Zone, Panama.

Better Fruit Publishing Company:

Hearing that you publish a valuable fruit paper, I would like to have sample copies of same, as I am interested in fruit growing in the Northwest.

V. W. Ashbaugh.

Medford, Oregon.

Better Fruit Publishing Company:

Enclosed please find my check for two dollars for your paper. Pardon my delay. You are publishing one of the best fruit papers that is published in America, and I want the same.

J. D. Olwell.

A DAY'S SPORT IN KENNEWICK VALLEY

FRUIT EXHIBIT AT THE HOOD RIVER APPLE SHOW

BY PROFESSOR C. I. LEWIS OF THE OREGON AGRICULTURAL COLLEGE

THE recent apple show, held in Hood River October 15th to 17th, was indeed a magnificent display. A thousand boxes of the highest grade fruit, carefully packed, is a grand sight. It would well repay our fruit growers of the Northwest to take a keener interest in such exhibits, for the information gained in apple packing and the opportunity to study the different varieties would well justify considerable expenditure. As usual, Hood River did herself proud and has no apologies to offer.

HOOD RIVER APPLE FAIR PACK

Having acted as judge two years ago, as well as this year, I was in a position to make careful notes on the progress made. Had the fair been held at a time when many of the growers were less busy, so that more attention could have been given by them to the exhibit, the progress would doubtless have been even more marked. All in all, the fruit and the pack were of a much higher grade than that of two years ago. Perhaps two varieties were not quite up to the high standard of the previous exhibit, namely, the Newtown and the Arkansas Black, the latter having not as yet developed its best color. In the matter of pack, much advance was made, there being this year but very few freak packs, and nearly every box was put up along the lines of the best commercial packs. Another point worthy of attention and which was very pleasing to the judge, was the withholding the names of the exhibitors until the awards were made. Advance was also made by classifying apples according to tier, thus not throwing into the same competition the largest and smallest apples. This will probably lead in the near future to a classification based on the number of apples contained in a box, the word "tier" being dropped.

The Hood River growers have learned that size is not the ruling requisite of excellence, and, as a rule, the largest apples were out-pointed by such characteristics as uniformity, color and freedom from blemishes. In many cases there was a large number of entries, and this made very difficult judging. It would be much easier if fruit could be grouped according to class and variety, but such a plan is not always feasible where many growers desire to make large exhibits and wish to group their fruit. It might be found to be a good plan to have the fruit brought in somewhat earlier and allow it to be judged before exhibited to the public. Under this system the boxes could be grouped for judging and later placed in the individual exhibits. Under such a system the judging could probably be easily accomplished in half a day. It might also interest many growers to have the entry requirements and the score cards to be used by the judges published and distributed some time previous to the fair.

Our apple fairs can be made to serve many purposes. Two of the principal ones are to advertise the resources of a country and to educate the people. I believe that we can develop the educative phase much more than has yet been done. For instance, public exercises might be given by judges, wherein is explained why certain decisions were made. A cup might be offered in a judging contest in which young men of the community could be allowed to compete. Another feature that might interest a great many people would be an apple packing contest, wherein the conditions are made as uniform as possible. Another educative feature of great value would be the display of fruit to illustrate the variation in type. For example, Yellow Newtowns could be collected from trees of various ages, from different soils, from trees subjected to different methods of culture.

The committee and superintendent deserve a vote of thanks from the growers of Hood River for the magnificent display and the manner in which the fair was conducted. The fair being held unexpectedly in the rush of the picking season, because of the very rapid maturing of fruit, made the collection of such a large exhibit of fruit a very difficult task.

The full list of winners is as follows:

Best general box display—Hood River Fruit Company, first; H. R. Albee, second.

Best five boxes—E. H. Shepard, first; M. H. Hill, second.

INTERIOR VIEW OF HOOD RIVER BIENNIAL FAIR

Best general plate display—J. L. Carter, first; Frank McFarland, second.

Best four tier Spitzenbergs — E. H. Shepard, first; L. E. Clark, second.

Best three or three and a half tier Spitzenbergs—E. H. Shepard, first; M. H. Hill, second.

Best four tier Newtowns—J. L. Carter, first; M. M. Hill, second.

Best three or three and a half tier Newtowns—George Chamberlain (Mosier), first; T. A. Reavis, second.

Best box of Ortleys—J. M. Elliott (Mosier), first; Smith & Lawrence, second.

Best box of Arkansas Blacks—M. M. Hill, first; J. L. Carter, second.

Best general plate display pears—J. L. Carter.

Best box of Jonathans — Davidson Brothers, first; C. T. Roberts, second.

Best Gravensteins—Wm. H. Kollock.

Best box Hydes King—N. C. Evans.

Best box Mammoth Black Twigs—Peter Mohr.

Best box Russian Red—W. L. Nichols.

Best box Roxbury Russets — J. L. Carter.

Best box Rhode Island Greenings — E. H. Shepard.

Best box Winesaps—F. G. Church.

Best box Wagners—H. O. Sieverkropp.

Best box Swaar—J. L. Carter.

Best box Kings—M. M. Hill.

Best box Baldwins—L. E. Clark.

Best box Geniton—Mrs. Alma Howe.

Best box Northern Spy—E. H. Shepard.

Best box Red Cheeks—E. H. Shepard.

Best box Winter Bananas — Wilson Fike.

Best box Ben Davis — Holbrook & Stebbins.

Best box Gano—Holbrook & Stebbins.

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The Willamette Valley is showing a greater interest in the fruit industry than ever before for many years. Not only that, but they are doing better work, growing better fruit and putting up a better pack.

BREATHING OF FRUIT

IT SEEMS that apples—or fruits of any kind—keep better in cold storage, because there they do not breathe so fast.

Parts of plants that have been cut from the main stem do not die at once, but retain life and continue to breathe for quite a while. This is true of flowers as well as of fruits. Some live much longer than others.

Breathing, in plants or animals, causes destruction of matter in their cells. Under ordinary conditions this loss is made good by food supplied in one way or another. But fruit that has been picked is undergoing a process of progressive starvation. It still breathes, with nothing to compensate for the loss. Consequently, it steadily diminishes in weight.

An apple will keep longer if its respiration is made slower. This is accomplished by putting it into cold storage—whence the effectiveness of that method of preserving fruit. The fruit breathes from four to six times as fast out of cold storage as in it.

The loss of weight shown by apples in cold storage is not due, as used to be supposed, to the mere drying out of the water they contain. If that were so the proportion of water to dry matter in the fruit would become less.

Fruit breathes much more rapidly when warmer and more slowly when cooler. In a cool cellar, for this reason, it keeps more than twice as long as in an ordinary room, though only half as long as in cold storage.

The breathing of an apple may be observed at leisure but putting it into a glass jar, shut tight. In a few hours a dewy film will cover the inner surface, and in time the moisture will collect in drops and trickle to the bottom. Open the jar, pour in a little clear lime-water (without touching the fruit), and it will turn milky, just as would happen if an animal's breath were forced through it.—Saturday Evening Post.

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CROWD AT EUGENE, OREGON, VISITING SOUTHERN PACIFIC DEMONSTRATION TRAIN

FRUIT-GROWING CAR, SOUTHERN PACIFIC RAILROAD DEMONSTRATION TRAIN

TRIP OF THE DEMONSTRATION TRAIN A SUCCESS

BY C. I. LEWIS, HORTICULTURIST, OREGON AGRICULTURAL COLLEGE, CORVALLIS

THE Southern Pacific Company and the Oregon Agricultural College recently conducted in the Willamette Valley a demonstration train that was unique in being the largest and most complete train of its kind ever run. The success of the train was largely due to the combined efforts of R. B. Miller, general freight agent of the Harriman lines, and Dr. Withycombe, director of the Oregon Experiment Station. All the leading lines of agriculture were represented and thirty thousand people were enabled to see the exhibit and have a college on wheels brought to them. The first car, in charge of Dr. Withycombe, was devoted to animal husbandry. It contained two blooded cows, standing in model stalls. At each station a cow was milked by a milking machine. The second car, in charge of Professor H. D. Scudder, was devoted to agronomy, treating of such subjects as soils, drainage, irrigation, seed selection and germination and crop rotation, all nicely illustrated by charts and apparatus. In this car was also installed a model electric lighting plant, which furnished the power for thirty sixteen-candle-power lamps. Such a plant is well adapted for a farm and can be installed at a cost of three hundred dollars. In a third car was a model dairy, in charge of Professor F. L. Kent. Boilers, sinks, separators, churns and other dairy apparatus were shown. Charts were displayed, showing the advantages of the best methods of cream separation and the necessity for better dairy cows. A portion of this car was devoted to plant diseases and insect pests, in charge of Professor A. B. Cordley. This feature of the train attracted a great deal of attention from fruit growers, as mounted specimens of the various pests were on display. A collection of Yellow Newtown apples, giving the results of spraying for scab, was very instructive. The fourth car was devoted to horticulture, and was in charge of Professor C. I. Lewis, who was assisted by Mr. C. A. Cole and Mr. R. W. Allen, assistant horticulturists, who gave instruction in apple packing and budding and grafting respectively. This car was intended to represent the various phases of orchard management. The selection of soils, cultivation, plotting and setting out of fruit trees, pruning and thinning, were all shown. Collections of pruning tools, spraying apparatus, fruit packages and varieties of fruit adapted to the Willamette Valley, were on display. The demonstrations in pruning, apple packing, and budding and grafting were held outside the cars.

DAIRY WORK AND ORCHARD DISEASES CAR, SOUTHERN PACIFIC RAILROAD DEMONSTRATION TRAIN

SOME PRACTICAL IDEAS IN SPRAYING OUTFITS

A MAN who has had some experience in fruit growing, a thorough machinist and one who has put in some considerable time with a view to improving the present spraying outfits and getting out something that will be better than anything that has been made up to the present, has given us the following idea, which seems worth while publishing:

He says the greatest reason against the use of iron pumps, pipes, fittings and air pumps in spraying outfits is that sulphate of iron will be formed when the solution and copper sulphate is brought in contact with iron. He says that it is an established fact that the sulphate of iron solution will kill vegetation. The only safe way would be to use a spray outfit that has brass pumps, pipes, fittings, air pump, etc., so that no iron will come in contact with the spray solution when using bordeaux mixture.

I do not know that his claims are true, but if it is true that the copper sulphate combines with the iron when the two come in contact, forming a sulphate of iron, and if it is true that the sulphate of iron kills vegetation, this will probably account for a good deal of the rusting or burning of apples that growers have met with in spraying when using the bordeaux mixture.

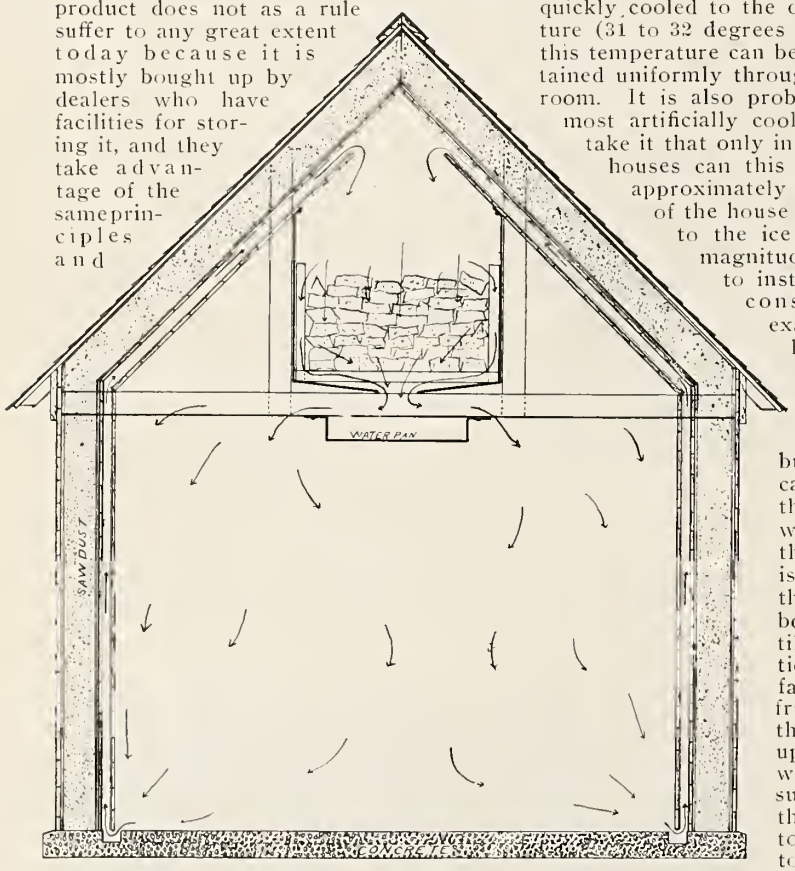
SEEDS, TILE DRAINAGE, IRRIGATION AND FERTILIZER CAR, SOUTHERN PACIFIC RAILROAD DEMONSTRATION TRAIN

BETTER FACILITIES FOR THE STORAGE OF FRUIT

ROBERT S. NORTHROP, HORTICULTURIST UTAH EXPERIMENT STATION

WITH the constantly increasing production of fruit in the western part of the United States, the time is fast approacing when more attention must be given to its storage, that advantage may be taken of its high quality. This is particularly evident when we consider that the bulk of our best fruit reaches the market at the same time that the inferior fruit, which neither will pay for nor stand storage, is there, thus through comparison of prices being forced to sell much lower than it should. With storage, however, it would be held back until most of the inferior crop which sells at a low price is withdrawn, and then could be sold nearer its value.

It is true, of course, that the very best product does not as a rule suffer to any great extent today because it is mostly bought up by dealers who have facilities for storing it, and they take advantage of the same principles and also of the profits, which in justice belong to the grower who has brains and energy sufficient to produce it. When we consider the immense acreage which is constantly being planted, it seems evident that the time is not far away when the buyers cannot handle all of the high grade fruit in their own houses, and that means that local storage must be practiced by all of the leading producers.



GOOD PLAN FOR COLD STORAGE HOUSE FOR HOME USE
The ice being placed in the top keeps the temperature even in all parts of the building, and provides better air drainage by forcing it to circulate.

Some producers now use cellars to advantage, because of the higher prices at selling time more than making up for the losses sustained by poor storage facilities. It is clear though that if part of the fruit should keep well, all of the same grade should keep if properly ventilated and cared for—in other words, if storage facilities are what they should be.

The fruit storage investigations of the Department of Agriculture show conclusively that the question of ventilating and holding of a uniform and constant temperature is essential to the best results, and that without these essentials more or less loss is sure to be the result. This being true, it is evident that the day of the ordinary cellar, cooled by being left open at night, is doomed, at least, so far as being used by progressive growers of the best grade of fruit is concerned, and the other class of producers never use any means of storing, being contented to sell from the trees or immediately after, allowing the other party to take the profits.

The question of the best means of storing, then, is one that should interest all wide awake producers and no doubt does, but it also is probably true that they can find no really satisfactory manner of building a house that can be quickly cooled to the desirable temperature (31 to 32 degrees F.), and in which this temperature can be constantly maintained uniformly throughout the storage room. It is also probably true that in most artificially cooled houses, and I take it that only in artificially cooled houses can this question be even approximately met, the portion of the house given up to ice or to the ice plant is of such magnitude or so costly as to instantly bar it from consideration. For example, consider a house cooled by ice which is kept in a compartment at one end of the building. Any one can see that here the great objection would be the fact that the warm air is at the top and the cold air at the bottom and no ventilation or circulation of air; also the fact is evident that fruit more than one-third the distance up from the floor will not be cooled sufficiently, or that the fruit at the bottom will be cooled too much for best results.

The cut of the Norman cold storage, accompanying, shows clearly how these undesirable features can be eliminated if one is desirous of erecting a plant which will conform to all of the requirements of ventilation, uniform constant temperature and greatest available storage room. Here the ice is stored in the upper part of the building, upon a heavy grating which holds it above the water pan that collects all water as fast as supplied by the melting ice. The cold air resulting is heavier than the warm air next the walls in summer or fall, and therefore drops down, drawing in the warm air from around the sides and cooling it. This plainly keeps up a rapid circulation which extends to all parts of the house and makes the temperature uniform, while it is kept constant because as the temperature outside rises the circulation is more rapid and vice versa. Also, in exceedingly cold weather the ice supply need not be maintained and the air cur-

rent reverses itself, while the heavily padded walls keep out frost. Now, as this circulation takes place the air is kept constantly passing over the ice and water, which remove the impurities collected to be passed off into the drain from the water pan. We all realize how after a rain the air is sweet and clean; so here, the room is always sweet and free from odors, and fruit kept all winter in such a storage never takes on that peculiar and obnoxious flavor and odor so common to stored material.

Taken all together, this house gives results as good as could be desired in economy of space (the ice being in attic), ventilation and ability to maintain uniform constant temperatures, which results in fruit, etc., keeping in perfect condition for the greatest possible length of time.

OUR POULTRY GROWERS

PREPARED poultry foods and remedies are just the thing for fruit growers who have a few chickens. You don't want a whole lot of bother, and that's where package goods come in. Scratch food, egg food, feather food, chick food—all well-balanced rations—are sold in packages, as are full lines of poultry remedies. When these goods come from a reliable house especially a manufactory located in this part of the country and understanding climatic conditions here—the amateur poultryman can feed them to far better advantage than any home-made food he can prepare.

The cost of the package foods is far less, when the value of the ingredients is considered, than what a balanced ration can be prepared for at home, and there is the certainty that the ration is well balanced. It is far safer to take a prescription put up by a druggist, and likewise there is more certainty of poultry success if feeds are prepared by specialists.

Watch the advertisements of prepared poultry foods and remedies in "Better Fruit." There is one this month—that of the Charles H. Lilly Company of Seattle and Portland—and its suggestions ought to be remembered by all our readers who keep chickens.

FRUIT TREES IN WASHINGTON BY COUNTIES

COUNTIES	Apples	Pears	Quinces	Peaches	Cherries	Plums and prunes	Apricots	Almonds	English walnuts	Total fruit acreage by counties
Adams	4	1	0	1	1	1	0	0	0	8
Asotin	960	125	3	420	333	229	31	3	15	2,120
Benton	364	24	1	183	165	5	11	0	68	821
Chehalis	74	4	2	0	2	9	0	0	4	95
Chelan	5,333	61	3	687	67	7	5	2	26	6,191
Clallam	57	5	0	0	8	6	0	0	2	78
Clarke	180	94	4	64	182	3967	2	1	30	4,524
Columbia	1,067	305	2	145	240	153	1	1	30	1,944
Cowlitz	2,200	153	3	8	53	92	2	1	22	2,534
Douglas	120	31	1	60	9	3	2	0	7	233
Ferry	120	29	1	10	11	38	1	1	4	215
Franklin	12	2	0	3	7	2	0	0	1	27
Garfield	667	61	2	153	120	69	7	5	8	1,092
Island	667	38	1	5	107	23	1	0	4	846
Jefferson	667	53	1	5	120	38	1	0	8	893
King	403	27	1	3	87	72	1	0	3	597
Kitsap	2,058	193	2	19	245	171	0	0	62	2,750
Kittitas	197	3	0	1	2	3	1	0	11	218
Klickitat	220	8	0	19	25	14	7	5	22	320
Lewis	933	8	1	1	15	61	0	0	4	1,023
Lincoln	393	31	2	117	26	19	1	0	33	622
Mason	80	15	1	1	19	6	1	0	14	137
Okanogan	433	12	0	28	16	30	5	0	2	526
Pacific	40	5	0	0	5	2	0	0	2	54
Pierce	3,476	122	4	2	213	168	0	0	25	4,037
San Juan	533	23	0	0	27	6	0	0	8	597
Skagit	800	15	1	1	27	14	0	0	11	869
Skamania	217	5	0	8	5	35	1	0	5	276
Snohomish	933	23	1	1	40	14	1	0	15	1,028
Spokane	4,149	73	2	15	107	91	1	1	26	4,465
Stevens	824	30	1	22	63	63	1	1	22	1,027
Thurston	1,040	8	1	0	110	636	1	0	15	1,811
Wahkiakum	13	4	0	0	4	3	0	0	1	25
Walla Walla	512	46	3	76	120	138	9	1	26	931
Whatcom	1,200	14	1	0	16	138	0	0	11	1,380
Whitman	2,711	196	5	593	255	764	68	2	37	4,631
Yakima	16,640	1977	9	3053	392	160	74	92	285	22,682
Totals	50,297	3825	59	5704	3244	7250	236	116	896	71,627

BETTER FRUIT

HOOD RIVER, OREGON

Official Organ of
The Northwest Fruit Growers' Association

A Monthly Illustrated Magazine
Published in the Interest of Up-to-Date
Fruit Growing and Marketing

All Communications Should Be Addressed and
Remittances Made Payable to

BETTER FRUIT PUBLISHING COMPANY

E. H. SHEPARD, Editor and Publisher
CHRIS GREISEN, Traveling Representative

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Entered as second-class matter December 27, 1906, at the post office at Hood River, Oregon, under act of Congress of March 3, 1879.

THE PORTER BILL.—We feel it our duty to make further editorial comment on the Porter bill, for the reason that this bill is objectionable to every district in the Northwest and is being opposed by every district we know of, without exception.

The proposed standard of the Porter bill is a bushel to contain 2,564 cubic inches—a heaping bushel. The Winchester bushel contains 2,150.4 cubic inches. This bushel is the United States standard. The standard Oregon box adopted by the Northwest fruit growers is 10½x11½x18 and contains 2,173.5 cubic inches. The special box used by districts in the Northwest is 10x11x20 and contains 2,200 cubic inches, but both of these boxes contain a bushel, according to the United States standard. If a gallon of any liquid is sold, a gallon is sold, and not a heaping gallon. When a pound package is sold, and sold by the pound, a pound is sold and not a heaping pound. We do not know of any other commodity which is sold by weight or measurement where a heaping quantity is the standard, and we do not know why apple growers should be asked to put up heaping bushels. It is also true that we do not sell apples by the bushel box. We sell them by the box. However, it happens that a box contains a full bushel.

Hundreds of articles and many different kinds of goods are sold by the package. A buyer goes in accordance with the size and not the quantity. The 10½x11½x18 box and the 10x11x20 box have been adopted by the Northwest Fruit Growers' Association. This association covers the states of Oregon, Washington, Idaho, Montana, Utah and British Columbia. More boxed apples are put up in these districts than are put up in all other states in America probably. These boxes are adapted to the requirements of the Northwest. By that we mean that they are made a certain size, which enables us to pack apples and put them up in uniform sizes. If the size of the box is changed the apples will not fit the box nor the box fit the apples. We would have to deviate from uniformity in our pack. Our pack is the best in the world and we do not wish and we do not intend to spoil it by putting it up in some other sized boxes. We will not do it. Eastern apple dealers and growers who do not put up boxed apples nor grow boxed apples, and who put up practically all apples in barrels, have no right to dictate what size or what shape we should use. They have no business to lay down laws for our business. We would consider it the height of gall on the part of the Northwest, which packs no apples in barrels, to dictate to Congress a law specifying what sized barrels the East should use.

Our apples fit these boxes. They will not fit any other size, packed out in the same uniformity. You cannot put a square peg in a round hole. What the Northwest wants to inform all Eastern apple men is that we cannot use the box suggested in the Porter bill and furthermore that we will not. In the language of Governor Pennoyer, who said to the President of the United States a few years ago, "You tend to your business and I will attend to mine," we say to the East, "You attend to the size barrels you want to use and the Northwest will attend to the size boxes it wants to use."

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GET up a club of four new subscribers. All we ask you to remit for the four is $2.00. Offer expires February 1, 1909.

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WE desire to extend our thanks to the Colorado Experimental Station through Professor Headden for the courtesy extended us in being permitted to publish the article on arsenical poisoning.

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ARSENICAL POISONING OF TREES.—The especial attention of orchardists is called to the article on this subject by Professor Headden of the Colorado Experimental Station, which appears elsewhere in this issue, and to the editorial note as well. We consider this article one of the most important that ever appeared in "Better Fruit."

"Better Fruit" is in a position to get all the latest orchard information. If it had not been for "Better Fruit" you might not have become possessed of this information for a year or two more, and in the meantime lost hundreds of trees. What is it worth to you to get such information and get it promptly? Just the subscription price of "Better Fruit" for a year, which is one dollar. What is it worth to you? We answer the question. Hundreds, yes, thousands of dollars, according to the size of your orchard.

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WE want to increase our subscriptions to "Better Fruit" for 1909 and do it quickly. We will take four new subscriptions to "Better Fruit" for a year in clubs of four for $2.00. Get busy. Help your neighbors by giving them this opportunity, by getting up a club of four, and at the same time help "Better Fruit," the official organ of the Northwest Fruit Growers' Association.

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PRESIDENT ROOSEVELT asks, "How can the life of the farm family be made freer from drudgery, more comfortable, happier and more attractive?" We answer the question as applied to a class of farming known as fruit growing. By adopting all the improved methods and up-to-date machinery and implements, thereby saving unnecessary labor, which is drudgery. It can be made more comfortable by doing better work, so as to increase the profits, which buy many of the comforts. It can be made happier

Our Unparalleled Clubbing Offers

"Better Fruit" offers to readers what it considers the finest list of clubbing offers ever placed before the public in the Northwest. Its variety is one that must appeal to readers of all classes. Look it over carefully, select the one you want and send us the proper amount and we will do the rest.

Review of Reviews $3.00
Success Magazine 1.00
"Better Fruit" 1.00
$5.00
All for $3.00

Sunset Magazine $1.50
Road of a Thousand Wonders. .75
"Better Fruit" 1.00
$3.25
All for $1.50

Pacific Monthly $1.50
Weekly Journal 1.00
"Better Fruit" 1.00
$3.50
All for $1.50

The Farmer (Spokane, Wash.) $0.50
"Better Fruit" 1.00
Both $1.00

Breeders' Gazette $2.00
"Better Fruit" 1.00
Both $2.00

Northwest Poultry Journal $0.50
"Better Fruit" 1.00
Both $1.00

Weekly Oregonian $1.50
"Better Fruit" 1.00
Both $1.50

Oregon Agriculturist ..... .50
"Better Fruit" 1.00
Both $1.00

American Fruit and Nut Journal ..... .50
"Better Fruit" 1.00
Both $1.00

World's Work $3.00
Everybody's Magazine 1.50
Delineator 1.00
"Better Fruit" 1.00
$6.50
All for $3.75

World's Work $3.00
Everybody's Magazine 1.50
"Better Fruit" 1.00
$5.50
All for $3.00

Review of Reviews $3.00
McClure's 1.50
Woman's Home Companion ... 1.00
"Better Fruit" 1.00
$6.50
All for $4.00

World's Work $3.00
Country Life in America 4.00
Everybody's Magazine 1.50
Delineator 1.00
"Better Fruit" 1.00
$10.50
All for $6.50

World's Work $3.00
Delineator 1.00
"Better Fruit" 1.00
$5.00
All for $3.00

Country Life in America $4.00
McClure's and Woman's Home Companion or Success 2.00
"Better Fruit" 1.00
$7.00
All for $4.75

Country Life in America $4.00
American and Success or Woman's Home Companion 2.00
"Better Fruit" 1.00
$7.00
All for $4.75

Country Life in America $4.00
Review of Reviews or Outing. 2.50
"Better Fruit" 1.00
$7.50
All for $4.75

Country Life in America $4.00
Everybody's Magazine 1.50
Delineator 1.00
"Better Fruit" 1.00
$7.50
All for $4.75

Country Life in America $4.00
"Better Fruit" 1.00
$5.00
Both for $4.00

Everybody's Magazine $1.50
Delineator 1 00
"Better Fruit" 1.00
$3.50
All for $2.25

Woman's Home Companion .. $1.00
"Better Fruit" 1.00
$2.00
Both for $1.40

Garden Magazine $1.00
Farm Journal ..... .75
"Better Fruit" 1.00
$2.75
All for $1.75

Garden Magazine $1.00
"Better Fruit" 1 00
$2.00
Both for $1.40

Farm Journal ..... $ .75
"Better Fruit" 1.00
Both for $1.25

Pacific Monthly $1.50
"Better Fruit" 1.00
$2.50
Both for $1.75

These clubbing rates do not apply in Canada owing to extra postage

by doing the daily work the quick way, the proper way, which shortens the hours, giving the family time for enjoyments and placing it in a condition to take enjoyment, and enjoyment is happiness. Life on the orchard farm will become more attractive as the business pays better, because better profits mean many things, at least to those who are generous. It means more comforts, more pleasures, better homes, better schools, better literature. In a word, a "better time."

Subscribe for "Better Fruit" and learn how to do those things which are necessary to be done to put yourself and family in a position to answer President Roosevelt's question, and to conclude by saying, "My life is free from drudgery. We are more comfortable. We are happier and our home is more attractive because we subscribed for 'Better Fruit,' which tells the orchardist how to do those things which will bring the results you ask for."

"Every man's ambition is to get into something that he enjoys doing, then his work will be made an inspiration to him and success will follow."

There are more contented people in fruit growing than in any other vocation that has come under our observation during our lifetime, and as a class in the splendid fruit sections of the Northwest the percentage of men making good money at the business is greater than any other calling we know anything about.

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PROMISES.—We might take up considerable space in outlining our plans for the coming year, but there are several reasons for not doing so. In the first place, it is easy to make promises, but sometimes difficult to keep them. Circumstances often arise at the last moment, the postponement of an edition. So we say, editorially and as publishers, that we offer "Better Fruit" of the past as evidence of our intentions for the future. We have made good. We will continue to do so.

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BETTER FRUIT was the first horticultural paper to issue an illustrated special packing edition. The first to begin in original style advertising association work. The first to advance a great many other ideas.

"Better Fruit" is the first horticultural paper to furnish the fruit grower with the first definite information of value on arsenical poisoning, a trouble that probably not one grower out of a hundred has ever heard of up to the present time. We presume that, as usual, other papers will be filled with it from now on. We hope so. We want all the fruit growers to get the information and get it quickly. We do not own the information, nor the earth, for that matter, either, but we do feel justified in claiming another "scoop" and we want our readers to know it and give us credit. Not for glory, but as a matter of business, important business, of value to you, Mr. Reader, as well as "Better Fruit."

If you will perceive and admit our claim, and you must of course see it is just, you will see the importance of being a subscriber to "Better Fruit" and of seeing that your neighbor is also. That means business for us. Business for us means that we can continue to give you "Better Fruit" at a dollar a year and make it "Better Fruit" in reality as well as in name.

HIGH PRICES PREDICTED FOR STRAWBERRIES

PEOPLE who remember with something of terror the dreadful days of 1871 when, as a consequence of the awful drought of that year, Chicago was fire-swept and all but destroyed, and several towns in Michigan and Wisconsin were at the same time wiped out of existence, declared during the early days of the autumn of 1908 that the drought of the present season could be compared only with that time. But in 1871 the drought was broken early in October, while up to this time (November 23) the drought of 1908 still remains unbroken, and the signs of the weather prophet give no promise of relief. Not since July has enough rain fallen to more than lay the dust, and this statement is true of a major portion of the United States. Letters from the Pacific Coast, from the Southern States and from nearly every state in the North and from the provinces of Canada, from British Columbia to Quebec, tell the same story of discouragement.

The effects of the drought were felt in few lines of production where the crops were ripened or practically out of danger before the present drought became very acute. But in the case of other crops, and especially in the case of nursery stock of the nature of plants, vines and bushes, the season has been the most destructive ever known. Many nurserymen whose practice it has been for years to ship strawberry plants for fall setting were compelled to notify their customers that they had no stock this year that could be used for that purpose, and many of them are now looking askance at the slim prospect ahead for strawberry plants for spring setting. The nursery that has succeeded in bringing out a half-crop of strawberry plants is the exception, we are advised, while many admit that the loss will run from 50 to 75 per cent.

One effect of this situation, of course, will be to send the price of plants to a somewhat higher point than ever before has been reached, as the scarcity of plants has made it necessary for the nurserymen to raise prices to save themselves. But another effect will be to make the strawberry itself a scarce article, because so many of the growers who have failed to take especial care of their plants during the drought will find themselves out of business. Nurserymen are looking forward to a tremendous business in plants in 1910 as a result of these conditions, and R. M. Kellogg Company, at Three Rivers, Michigan, writes us that they will set out 110 acres next spring, so confident are they that there will be an unprecedented demand for plants in 1910.

One important lesson to be learned from the existing situation is that the man who knows how to grow strawberries according to best methods has the opportunity of a lifetime to establish himself in the most profitable line of horticulture yet discovered. Never before has such a condition existed, and the practical strawberry grower who will set out a large acreage in the spring of 1909 will be able to sell all the fruit he can produce in the two succeeding years, at the least, for the highest prices ever paid for the fruit. A good strawberry field will be a regular gold mine, in the judgment of those familiar with the situation.

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Mr. Earl M. Wilson, Stark Bros. Nurseries and Orchards Company, Louisiana, Missouri:

My Dear Mr. Wilson: I want to thank you very heartily indeed for some of the very best apples I ever tasted in my life! Those apples were certainly delicious—without a question the finest I ever tasted—and different people in the office with whom I divided them join me in saying that they were the "best ever." Where can you buy them by the barrel—how much do they cost—and do they keep? I would certainly like to know where I could get a barrel of those apples for "home consumption," and I don't think they would be dear at any price. Thanking you again for your kindness, and with kind regards, I beg to remain, very cordially yours. D. L. Taylor,

President Long-Critchfield Corporation,
November 21, 1908. Chicago.

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KING DAVID

Bonita, Washington, October 15, 1908.
Stark Bros. Nurseries and Orchards Company, Louisiana, Missouri.

Dear Sirs: I have some very fine King David apples. I have about one box of No. 1, four tier and larger. I have a few Delicious, probably about one box.

My King David, both tree and fruit, have done fine. I have King Davids that knock the spots off of your plate that you had made last year. They haven't got a spot on them, except the little speeks and some light spots where they were shaded. I have some of them that measure eleven and one-half inches in circumference. They hang as well as the old Winesaps. Very few of them have fallen yet and we have had lots of very heavy windstorms this summer. They were grown without irrigation, and this has been one of the most trying years we have ever had since I came here. No rain for nearly five months and very hot weather part of the time.

Do you want the King Davids and the Delicious? If so, please instruct me where to ship and how.

King Davids and Delicious and Stayman Winesaps about as large as the ones I shipped you last fall. I shall send them to Spokane, I think, to the big apple show.

Well, I guess this is all. Will close with best wishes. I remain as ever, yours truly.

G. T. Goundrey.

KENNEWICK

WASHINGTON

Land of Sunshine and Flowers *With its Great Advantage—Early Fruit*

SOME KENNEWICK BUSINESS BLOCKS

Few people at a distance can realize what the climate means for Kennewick, and they never will know until they consult the market reports. These, of course, play no favorites, and must be accepted as proof. Any reasonable man, who will carefully look into conditions here, will be forced to admit that Kennewick has many advantages over any other irrigated district in the Northwest. The fertility of its soil is proven by results accomplished. Its water supply is ample and delivered by a gravity system, no expensive pumping plant to maintain, but the water in its natural course to the sea flows from the river into the canal, and from there is distributed over the land. The highest quality of fruit and vegetables are produced here. Competing transportation lines furnish direct, speedy and cheap freight rates to an ever-ready market, and last, but not least, the time of year that our climatic conditions enable us to get on the market. Note that our first asparagus appears about the middle of March, when all the rest of the Northwest is still wearing its winter clothes, and sells for 30 cents per pound. Radishes, lettuce, etc., appear about this time and compete with hothouse products. Kennewick's reputation as the "Land of the First Ripe Strawberry" is firmly fixed; the first crates selling at $15 per crate. Cherries, apricots, peaches, pears, grapes or melons, no matter what the products, Kennewick is there first with the goods and enjoys the markets without competition from ten days to three weeks, receiving the cream of prices and fattening the producer's purse. That is what the early climate means to Kennewick. Other districts may advertise as being "As early as Kennewick," but it is Kennewick that gets on the market with the goods, and don't you forget it.

The above statement of conditions being true, does it not occur to you that you should investigate Kennewick before you decide to locate? For further information address the following

KENNEWICK BUSINESS MEN

THE SQUARE DEAL REALTY CO.
H. M. ASHBAUGH & CO., Dry Goods
OMAR W. RICH INVESTMENT CO.
KENNEWICK TRANSFER CO.
FIRST INTERNATIONAL BANK
CHAS. H. COLLINS CO., Fruit and Produce
FIRST NATIONAL BANK
J. E. TULL, General Merchandise
KENNEWICK ICE AND COLD STORAGE PLANT
G. W. SHANAFELT & SON, Gents' Furnishings and Clothing

ALL OF KENNEWICK, WASHINGTON

SOME NEW FEATURES IN POWER SPRAYERS

THE Pacific Power Sprayer is manufactured by the Reierson Machinery Company of 182 Morrison Street, Portland, and presents several new and interesting features in power spray machines. The weight of this machine, complete with motor, 100-gallon tank, pump, fittings for two leads of hose, pressure gauge, relief valve, mechanical agitator, etc., is but 350 pounds, and the space it occupies is but 32 inches wide, 24 inches high and 52 inches long, and notwithstanding its small size, it is capable of maintaining higher pressure than any power sprayer now made. This is due to the pump and motor. The pump differs from any other spray pumps for power use in that it employs the old, time-honored displacement principle for high-pressure work. This pump is designed and made in the company's own shops expressly for this machine, and is extremely simple and strong. Only two valves are used in the entire system—one in the suction pipe, and one check valve in the discharge pipe, and they are so located that should they become clogged by sediment in the spray solution they can be opened, cleaned and replaced in one minute, and the only tool required is any old monkey-wrench. The displacement type of pump requires no close-fitting piston; all that is used is a brass plunger and packing gland in exactly the same manner as those used on heavy duty hydraulic pumps. The air chamber is large, being 18 inches high by 7 inches in diameter, with exceptionally thick walls to stand the high pressures of which this pump is capable. With the ordinary power spray pump it will be noted that there is more spray solution going back into the tank through the relief valve than is being used through the nozzles. This is due to the fact that in every instance the capacity of these pumps is from four to seven times greater than required to supply the nozzles. This means four to seven times the power, four to seven times the fuel expense, four to seven times the weight, wear and trouble, greater first cost and greater maintenance cost. Pumping more solution than is needed against high pressure is to be avoided from every standpoint of efficiency and economy, and the Pacific Spray Pump is provided with three different strokes, which permits the amount of solution pumped to be adjusted to the number of nozzles in use and the pressure employed. It is clear that more solution will be used with a given number of nozzles at 200 pounds than at 100 pounds, and this adjustment feature in the Pacific Pump tends to long life of the outfit, as well as economy in power and fuel.

The motor used is also worthy of special notice. This is an air-cooled engine with make-and-break sparking system and hit-and-miss type of governor, developing about one horsepower, and weighs

84 pounds. The cooling is the most efficient known. The cam arrangement is such that the exhaust valve is held open while two charges of cold air is drawn into the inside of the cylinder and discharged between power strokes. By this it will be seen that this motor is air cooled inside as well as outside.

The jack that drives the pump lever is back geared "16 to 1," while the lever driving the pump again multiplies the power about two and one-half times. This gives a total multiplication of the power between the motor and pump of 40 to 1 and is the secret of the immense pressures maintained by this outfit, and with the minimum amount of solution being pumped back through the relief valve, this outfit will do a day's work with two leads of hose on but little more than one quart of gasoline.

The agitator provided is a simple paddle sweeping the bottom of the supply tank sixty-four times per minute. To this paddle the end of the suction hose is attached, and the end of this hose, sweeping back and forth within one-eighth of an inch of the bottom of the supply tank sixty-four times per minute keeps the supply free from sediment.

The supply tank regularly furnished is made from heavy galvanized iron, both riveted and soldered, strongly braced with an iron band around the top, and provided with a tight-fitting cover. The equipment consists of fifty feet of special seven-ply spray hose, two extensions and two nozzles.

The frame on which the outfit is mounted has handles on each end, permitting two men to carry it with ease.

This outfit, when not in use for spraying, will pump water from the well, run grindstones, churns, washing machines, cream separators or do other light work that an engine of its size can pull.

The low price at which this complete outfit sells, net cash, $150, puts it within the means of every fruitgrower and will undoubtedly do its part towards better fruit, better prices for the grower and economy of spraying.

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THE man at Kennewick who says he kept the thermometer at 36 degrees in a forty-acre orchard by smudging, while outside of that field the mercury was five degrees lower, and in that way saved his fruit from frost, was talking through his hat. In smudging against frost there is no proposition to raise the temperature of the atmosphere, and even if it were raised, that would not prevent the fruit buds from being scalded at sunrise. The object of the smudge is to create a cloud of smoke and fog which will prevent the sun from scalding the fruit buds.

Frost itself never killed anything. It is the sudden appearance of the sun that does the damage, and the effect is just the same as if you had poured a tea kettle of boiling water on the plant.

Frost is congealed dew, and dew is sweat from the ground.

When the sky is clear and the air is still the crystals form, especially along the river bottoms and low places where there is no wind to dry off the sweat.

The reason the crystals form during such weather is because the upper stratum of air is cold and there is no blanket of cloud to prevent that upper stratum of cold air from descending.

If you find crystals of frost on your tomato vines, take your sprinkling pot and sprinkle the plants before sunrise, and you will find that no injury will ensue.

More than half a century ago, the people of Utah learned that fruit was never killed in the early spring where the orchard was in or near a canyon, where drafts of air at night kept the trees dried off.

Whenever possible the orchard should be either on the north side of a hill or in a canyon draft.—Northwest Farm and Home.

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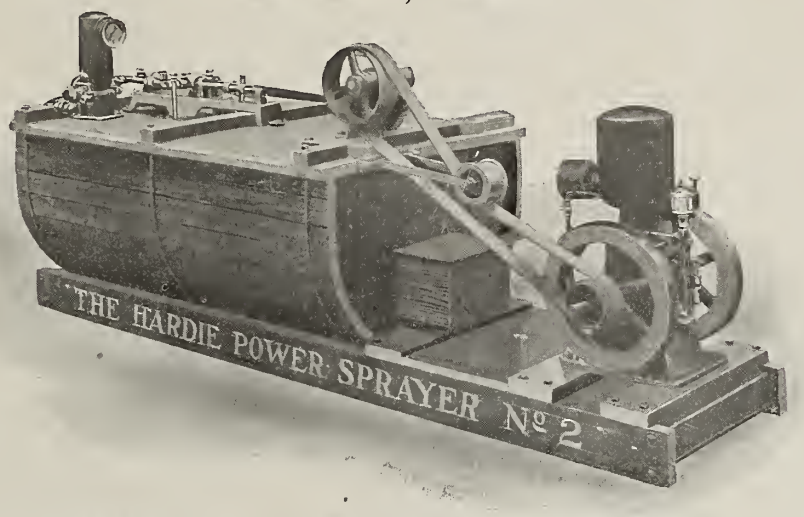

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The IDEAL machine for small orchards or where the land is hilly. This machine is equipped with everything to make it practical and convenient—Nozzle Protector, Relief Valve, Belt Tightener, Pressure Gauge, **All-Brass Pump** which is easy to repack; has Brass Ball Valves so arranged that they can be easily got at, Swinging Agitator, etc., etc. The engine is designed especially for the sprayer, is light, strong and compact; cools with two gallons of water. **EASY TO START, EASY TO OPERATE.** This machine will maintain a pressure of 150 pounds, discharging about 250 gallons per hour.

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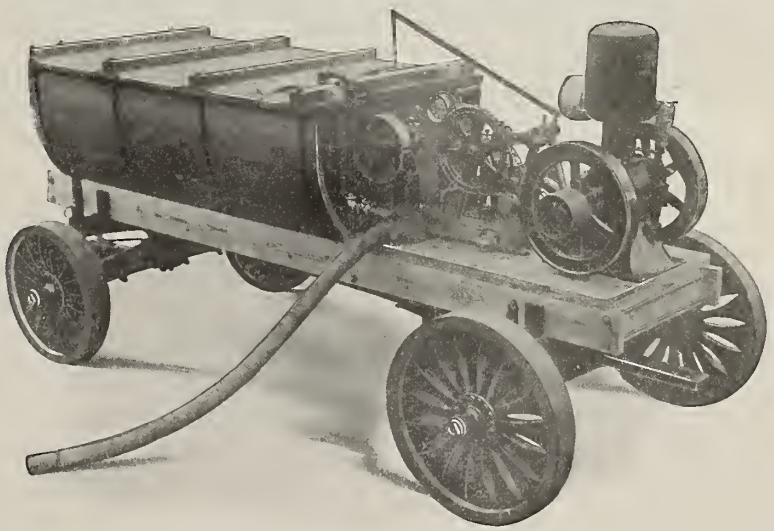

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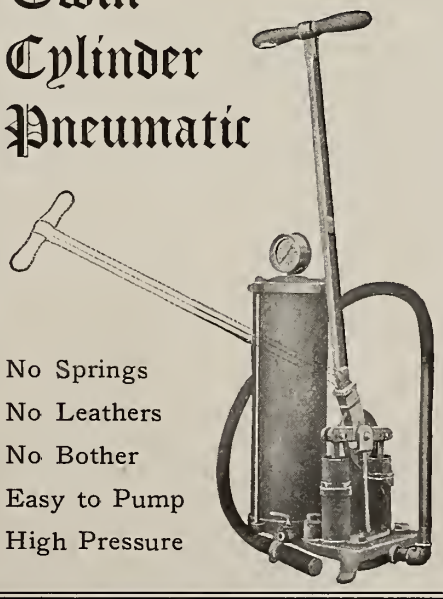

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